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of the
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AN IMPORTANT COURT DECISION

A court decision of great importance to veterinarians has just been rendered in the District Court of Dakota County, Minnesota. The case involved the practice of veterinary medicine by a corporation, and the decision of the lower court was favorable to the practicing veterinarians who were the plaintiffs in the case. The question is not a new one as far as other professions are concerned, the point having been the subject of legal controversy in a number of cases where the practice of medicine, dentistry or law was concerned.

For a number of years, a group of veterinarians have been practicing in the public stock yards at South Saint Paul, Minn., and their work, to a very large extent, has consisted of tuberculin-testing cattle shipped from the yards, not only to other points in Minnesota but to other states. More recently, these veterinarians have been conducting tests for Bang's disease. These veterinarians have an organization known as the Associated Veterinarians, and are under bond to the South Saint Paul Live Stock Exchange. Their charges for the various professional services are determined by an agreement with the Exchange.

Last spring, the South Saint Paul Stock Yards Company conceived the idea of employing one or two veterinarians, in order that they could make the inspections and perform the necessary

tests, the Stock Yards Company charging for the services and collecting the fees from the owner of the cattle. The plan was actually put into operation, and it was found that the schedule of fees to be charged by the Stock Yards Company was considerably lower than the fees charged by the Associated Veterinarians for the same service.

There is a law on the statutes in Minnesota, that has been upheld by the courts, which makes it unlawful for banks, real estate firms and other concerns to employ attorneys on a salary basis and then in turn to charge others for their legal services. With a court decision sustaining this law as it related to the legal profession as a background, it was decided to enjoin the Stock Yards Company from practicing veterinary medicine. This was done with the successful outcome above mentioned.

Dr. Chas. E. Cotton, Secretary and Executive Officer of the Minnesota Live Stock Sanitary Board, has been kind enough to send the JOURNAL a summary of the decision prepared by Mr. K. D. Stalland, the attorney who tried the case for the veterinarians. This summary will be found on pages 814-6 of this issue.

It should be pointed out that, in the event of the Stock Yards Company appealing this case to the higher court, and in the event of the latter affirming the decision of the lower court, the decision will apply to all states in the Union. The whole matter is of sufficient importance for every veterinarian in the United States to be interested and the JOURNAL will make a special effort to keep members of the A. V. M. A. informed of further developments. If the case is appealed, considerable money will be needed to fight the battle in the higher court. Of course, as matters now stand, it is up to the Stock Yards Company to appeal if they care to carry the case further.

PROPOSED AMENDMENTS

A number of proposals to amend the Constitution and By-laws of the A. V. M. A. were made at the meeting in New York the past summer, some based on recommendations contained in the presidential address of Dr. C. P. Fitch, while others were the outcome of the deliberations of the Executive Board and the House of Representatives. These proposed changes are of sufficient importance to warrant the careful consideration of every member.

Two of the amendments under consideration are closely related and have to do with the manner of electing presidents of the

A. V. M. A. On several occasions, the suggestion has been made that the national organization should seriously consider the plan of electing a president-elect, which is used by so many large national organizations with apparent satisfaction. The only difference from the present method would be to elect each president one year earlier than is now the case; in other words, to elect each president one year in advance of the date of his taking office. The advantages of this plan become more apparent, the more it is studied.

There is one distinct advantage that might be mentioned without referring to any of the others: By the time that the president-elect is inducted into office, he can have most, if not all, of his appointments decided upon, and about all that would remain to be done in this connection would be to hand the list of appointments to the secretary and have the latter write the usual letters of notification. Under the present plan, each year there is a period of several months following the annual meeting, during which our standing committees and resident secretaries are inactive, awaiting the action of the newly elected president in making his appointments.

At the 1933 meeting, held in Chicago, in his presidential address, Dr. N. F. Williams pointed out the desirability of the A. V. M. A. electing its presidents by mail ballot. This recommendation in due course was reviewed by a special committee of the Executive Board and then by the Board. The latter body passed the recommendation along to the House of Representatives with the suggestion that this body seriously consider the plan and, as a part of it, a proposal that three candidates for president be nominated by the House of Representatives at each annual meeting.

It will be seen that in the event of the proposed plan being adopted in its entirety, the election of president each year could be held immediately after the annual meeting, the polls to be open for the usual 60 days and, in this way, the proposal to elect each president one year in advance of the time of his taking office would be in effect for all practical intents and proposes. As an integral part of this plan, it is proposed that the president-elect immediately become an ex-officio member of the Executive Board, to take the place of the past-president, as is now provided.

It has been pointed out that the original plan of having the House of Representatives elect its own chairman each year, from among its own members, has certain disadvantages and, in lieu of this plan, it is proposed that the president of the A. V. M. A. be the presiding officer at all meetings of the House of

Representatives. This would do away with the necessity of holding an election each year.

Another amendment that has been initiated would provide for the creation of another permanent committee—a Committee on Public Relations, to take the place of the Special Committee on Agricultural Extension Service, which has been in existence for about five years. It is just possible that the right thing to do in this particular case is to change the name of the present Committee on Policy to Committee on Public Relations, as it is believed that the functions of the latter committee would be very much the same as those which originally were intended for the Committeee on Policy, a body that has been somewhat inactive during recent years. This may not be the best solution of the present problem, but it is being offered in the form of a suggestion.

One other proposal provides for the creation of an additional class of members, to consist of persons who are closely identified with veterinary work but who do not possess a degree in veterinary medicine. It is not known definitely how much demand there would be for this particular class of membership, but it is safe to say that it never would be very large. The proposal is worthy of careful study, as substantially the same recommendation has been made by two presidents of the A. V. M. A. during recent years.

Attention is being drawn to these proposed amendments to the Constitution and By-Laws of the A. V. M. A., so that they may be discussed at meetings of state associations that will be held during the next few months. It will be in order for the House of Representatives to take final action on these proposals at the meeting in Oklahoma City next summer. The House of Representatives consists of delegates from the 43 states that have affiliated with the A. V. M. A., and it is expected that these delegates will act in the interests of the members whom they represent. These members, then, should realize their responsibilities and express themselves on these various questions so that their delegates will be in a position to vote intelligently when these amendments come up for final action. The proper time and place for these matters to be discussed is at the meeting of each association when the A. V. M. A. delegate makes his report. The secretary of each state association has been requested to provide a definite place on the program of the meeting following the A. V. M. A. convention, for the state association delegate to make his report. In this way and to a large extent, one of the major

aims of the new plan of government in the A. V. M. A. will have been accomplished, namely, a more intimate connection between the various state associations and the national body.

THE CLINIC'S THE THING

Perhaps the most outstanding feature connected with the meetings of veterinary associations during the past year is the large number of these gatherings that have had clinics, either as a large part of the program or constituting the entire program. Clinics are not new to veterinary meetings. Neither have they been considered as absolutely necessary adjuncts to programs of meetings. However, nobody dare deny their popularity and pulling power. Clinics have been held in all sorts of places and under a great variety of conditions—good, bad and indifferent. Some veterinarians are very much in favor of clinics, while others do not hesitate to say that they do not care for the kind of clinic that many of us have been accustomed to seeing. Some like the old-fashioned one-ring clinic, while others express a preference for the more modern specialized form, with separate clinics for horses, cattle, swine, small animals, poultry, laboratory diagnosis, etc., while still others apparently have no well-defined likes or dislikes in the matter.

To many, there is something peculiarly fascinating about a surgical clinic, and it is quite interesting to watch an audience while one is in progress. Many times, a majority of those present will not be paying any attention to what is going on, for the simple reason that they cannot see. Many will be conversing quietly with their neighbors. Perhaps an operation is being performed, and it has reached a stage where nobody can see what is being done, not even the operator. Such occasions present splendid opportunities for visiting. Usually, if the clinic is being conducted in the open, and sometimes when it is not, many of those in the audience are observed smoking very contentedly. This connotes a certain freedom of action at most clinics that produces a very noticeable degree of wholesome satisfaction on those present. There is very little restraint—except on the patient. You can come and go as you please. You take your place wherever there is a vacant spot, whether it be a comfortable chair, a circus seat, atop a rail fence or, perhaps, standing room only.

At times, there is an air of expectancy that pervades a clinic while an operation is in progress. Something is about to happen. Nobody knows just exactly when or what it will be. Most eyes

are on the operator; a few are on the subject. Everybody is tense for the moment. The operation is at a critical stage. The operator is silent, as are his assistants. Everything is not just exactly as it should be. The operator appears to be just a bit puzzled. Then suddenly a very distinct air of relief is manifest. There is more action. The operator smiles, passes a quiet word to an assistant, proceeds with the operation, finishes it. The tenseness has disappeared. There is an increased murmur audible on all sides as interrupted conversations are resumed. Cigars are lighted again. Some of the observers get up and stretch. A few leave and newcomers take their places.

The demonstrations and operations which make up the program of practically any clinic can be divided into two groups: those which are of such a nature that practically everybody in the audience can see plainly what is done, and those which can be seen to any advantage by only a comparatively small number of observers who are able to get close enough to the field of operation. It is here that certain difficulties enter into the problem of selecting operations and demonstrations for a clinic program. In the case of those operations which are of such a nature that they cannot be seen by more than a few, much depends upon the ability of the operator to describe plainly and accurately each step in the technic of the operation, including the proper names of all anatomical structures involved. Some clinicians and surgeons have a very well-developed ability in this direction while, unfortunately, others, although skillful operators, are not gifted with an ability to talk and operate at the same time.

Recent meetings that come to mind, while reviewing the subject of clinics, include the fourth annual Practitioners' Clinic, held at Mechanicsville, on June 14, sponsored by the Eastern Iowa Veterinary Association, with 265 practitioners from six states in attendance. This clinic had sections for small animals, horses, cattle, swine, poultry, sheep and laboratory diagnosis. Two weeks later, the 52nd annual meeting of the Michigan State Veterinary Medical Association was held at East Lansing, and all of the first day was devoted to a clinic featured by eight operations and demonstrations during the day. The day after the Michigan meeting, the second annual clinic of the Mississippi Valley Veterinary Medical Association was held at Peoria, Ill., with a large attendance from Iowa, Missouri and Illinois. On this occasion, all branches of practice received appropriate attention.

Then for the first time, the Nebraska State Veterinary Medical Association put on a summer clinic, on June 28, and this

proved to be so successful that it has been decided to have another one during the summer of 1935. Quite a number of local associations throughout Indiana featured their meetings the past summer and fall with surgical clinics, and the reports received would indicate that these were highly successful in every case. The JOURNAL already has published a rather full account of the small-animal clinic held in conjunction with the Twelfth International Veterinary Congress the past summer. This was a marked departure from the programs of all previous congresses. There have been other clinics held during the past year, but those mentioned here will serve as illustrations of the marked trend of programs for veterinary meetings nowadays.

PENNSYLVANIA TAKES ADVANCED STEP

Entrance requirements to the School of Veterinary Medicine of the University of Pennsylvania will be increased to include a year of college work in addition to four years of high school work, effective at the opening of the 1936-1937 session. Two years of college work in addition to four years of high school work will be required of those students matriculating in the veterinary course for the session, 1940-1941. A committee of the veterinary faculty is preparing an outline of what is considered to be an ideal course of study in high school and college in preparation for the study of veterinary medicine.

The decision to increase the requirements at Pennsylvania was made by the Board of Trustees of the University of Pennsylvania following a very careful study of the question by a faculty committee and appropriate resolutions adopted by the faculty recommending these changes to the Board of Trustees.

The action of the University of Pennsylvania in adopting the so-called five-year curriculum in veterinary medicine increases to six the number of veterinary colleges in the United States to take such action. It is believed that Pennsylvania is the first institution to announce a definite decision in favor of two years of preveterinary work, although the desirability of this step is being seriously considered by other veterinary colleges.

With 60 per cent of the colleges in the United States now definitely committed to the so-called five-year course in veterinary medicine, we would not be surprised to learn of other institutions taking this step before the close of the present college year.

An analysis of the statistics covering the enrollment of students for the current year, published in the November issue of the

JOURNAL, shows that the five colleges now operating on the five-year basis have 1,001 students enrolled. Even deducting the 222 pre-veterinary students reported by four of the colleges, there are 779 students registered in the four regular classes in these institutions, whereas the five other colleges, those that do not require the year of pre-veterinary work, have only 642 students enrolled. This might be interpreted as showing a preference for the longer course.

ADD VIRGINIA AND OREGON

Gradually the list of tuberculosis-free states is lengthening. Two more names were added to the list on November 1, Virginia and Oregon. The Old Dominion is the fourth state on the Atlantic Coast to be accredited, joining North Carolina, Maine and New Hampshire. Oregon is the second state on the Pacific Coast, just six months behind Washington. Seventeen states are now practically free of bovine tuberculosis.

The accreditation of Virginia solidifies a large area, consisting of nine states, extending all the way from North Carolina on the east to Wisconsin on the west, and comprising 407,926 square miles. The addition of Oregon to the accredited list also solidifies another large section, consisting of five states—Washington, Oregon, Idaho, Nevada and Utah—with a total area of 443,991 square miles.

If it were not for several counties in Montana that have not yet been designated as modified accredited areas, it would be possible to go all the way from the Atlantic Coast to the Pacific and make the entire trip through tuberculosis-free territory. One would pass through Minnesota (not yet accredited) on such a trip, but it would be possible to cross the state at numerous places without touching a county that has not been accredited. It is expected that both Minnesota and Iowa will be added to the honor roll in the very near future.

HORSE-DRAWN BATTERIES RETAINED

War Department plans for the motorization and mechanization of artillery units, to become effective December 1, provide for the retention of 33 horse-drawn batteries of 75-mm guns, while 41 units will be motorized.

After discussions which have continued in military circles since the World War, the Army has decided that, despite the greater

mobility of motor-drawn guns on *good roads*, the horse may be a pretty good form of motive power to have available when the going is not so good.

The horse-drawn artillery, it is announced, will be retained at Fort Sheridan, Illinois; Fort Hoyle, Maryland; Fort Sam Houston, Texas; Fort Riley, Kansas; Fort Snelling, Minnesota; Fort Myer, Virginia; Fort Francis E. Warren, Wyoming; Presidio of Monterey, California; Fort Bliss, Texas; Fort Benning, Georgia; Fort Bragg, North Carolina; and Fort Sill, Oklahoma.

APPLICATIONS FOR MEMBERSHIP

(See July, 1934, JOURNAL)

FIRST LISTING

BIGELOW, BALFOUR — 531 E. Olive St., Turlock, Calif.
B. S., D. V. M., State College of Washington, 1933
Vouchers: Horace B. F. Jervis and Wm. R. Kermen.

DENNIS, WILLIAM A. — 9 Elmwood Ave., Jamestown, N. Y.
D. V. M., Cornell University, 1926
Vouchers: Frank E. McClelland and E. R. Cushing.

ELWOOD, GUILFORD S. — 1904 W. North Ave., Chicago, Ill.
B. S., University of New Hampshire, 1929
D. V. M., Ohio State University, 1932
M. S., Ohio State University, 1933
Vouchers: O. Norling-Christensen and John B. Jaffray.

FLOYD, JAMES H. — Pepper Ridge Rd., Stamford, Conn.
D. V. M., United States College of Veterinary Surgeons, 1918
Vouchers: Charles E. Flaxman and M. Ray Powers.

NEAL, CHARLES W. — 1619 S. Laredo St., San Antonio, Texas
D. V. M., Agricultural and Mechanical College of Texas, 1931
Vouchers: Matthew E. Gleason and W. R. McCuistion.

Applications Pending

(See November, 1934, JOURNAL)

SECOND LISTING

Johnson, Samuel A., Broad St., Kinderhook, N. Y.
Page, H. F., Odon, Ind.
Person, O. H., Wahoo, Nebr.
Peterson, W. C., Sleepy Eye, Minn.
Skillen, Donald R., 751 Foothill Blvd., La Canada, Calif.
Stevenson, J. C., 290 Post Ave., Westbury, N. Y.
Warwick, B. L., Texas Agricultural Experiment Station, College Station, Texas.

The amount which should accompany an application filed this month is $5.42, which covers membership fee and dues to January 1, 1935, including subscription to the JOURNAL. It is suggested that applications filed this month be accompanied by remittance for $10.42, the additional $5.00 being for the 1935 dues.

COMING VETERINARY MEETINGS

Horse and Mule Association of America. Palmer House, Chicago, Ill. December 5, 1934. Mr. Wayne Dinsmore, Secretary, Union Stock Yards, Chicago, Ill.

Saint Louis District Veterinary Medical Association. Melbourne Hotel, Saint Louis, Mo. December 5, 1934. Dr. Harley B. Wood, Secretary, 2754 Meramec St., Saint Louis, Mo.

National Association of B. A. I. Veterinarians. Hotel La Salle, Chicago, Ill. December 5-7, 1934. Dr. F. A. Imler, Secretary, Box 187, Kansas City, Kan.

United States Live Stock Sanitary Association. Hotel La Salle, Chicago, Ill. December 5-7, 1934. Dr. O. E. Dyson, Secretary, Live Stock Exchange Building, Wichita, Kan.

East Tennessee Veterinary Medical Society. White Surgical Supply Building, Knoxville, Tenn. December 8, 1934. Dr. R. E. Baker, Secretary, Morristown, Tenn.

Interstate Veterinary Medical Association. Elks Building, Omaha, Nebr. December 10, 1934. Dr. G. L. Taylor, Secretary, Plattsmouth, Nebr.

Chicago Veterinary Medical Association. Palmer House, Chicago, Ill. December 11, 1934. Dr. O. Norling-Christensen, Secretary, 1904 W. North Ave., Chicago, Ill.

San Diego County Veterinary Medical Association. San Diego, Calif. December 11, 1934. Dr. L. K. Knighton, Secretary, 3438 Mountain View, San Diego, Calif.

Nebraska State Veterinary Medical Association. Omaha, Nebr. December 11-12, 1934. Dr. E. C. Jones, Secretary, c/o Platte Valley Serum Co., Grand Island, Nebr.

New York City, Veterinary Medical Association of. Hotel New Yorker, 8th Ave. and 34th St., New York, N. Y. December 12, 1934. Dr. R. S. MacKellar, Jr., Secretary, 329 W. 12th St., New York, N. Y.

Southeastern Michigan Veterinary Medical Association. Detroit, Mich. December 12, 1934. Dr. A. S. Schlingman, Secretary, Parke, Davis & Co., Detroit, Mich.

Tulsa County Veterinary Association. Tulsa, Okla. December 13, 1934. Dr. J. M. Higgins, Secretary, 3305 E. 11th St., Tulsa, Okla.

Western New York Veterinary Medical Association. Buffalo, N. Y. December 13, 1934. Dr. F. F. Fehr, Secretary, 243 S. Elmwood Ave., Buffalo, N. Y.

Kansas City Veterinary Association. Baltimore Hotel, Kansas City, Mo. December 18, 1934. Dr. C. C. Foulk, Secretary, 1103 E. 47th St., Kansas City, Mo.

Southern California Veterinary Medical Association. Chamber of Commerce Building, Los Angeles, Calif. December 19, 1934. Dr. T. G. Beard, Secretary, 3684 Beverly Blvd., Los Angeles, Calif.

Keystone Veterinary Medical Association. Philadelphia, Pa. December 26, 1934. Dr. C. S. Rockwell, Secretary, 5225 Spruce St., Philadelphia, Pa.

American Association for the Advancement of Science. Pittsburgh, Pa. December 27, 1934-January 2, 1935. Dr. Henry B. Ward, Secretary, Smithsonian Institution Building, Washington, D. C.

Minnesota State Veterinary Medical Society. Hotel Lowry, Saint Paul, Minn. January 3-4, 1935. Dr. C. P. Fitch, Secretary, University Farm, Saint Paul, Minn.

New Jersey, Veterinary Medical Association of. Hotel Hildebrecht, Trenton, N. J. January 3-4, 1935. Dr. John G. Hardenbergh, Secretary, c/o Walker-Gordon Lab. Co., Plainsboro, N. J.

Intermountain Livestock Sanitary Association. Ogden, Utah. January 4-5, 1935. Dr. D. E. Madsen, Secretary, Utah Experiment Station, Logan, Utah.

California State Veterinary Medical Association and University of California Veterinary Conference. University Farm, Davis, Calif. January 7-10, 1935. Dr. Cliff D. Carpenter, Secretary, 337 Central Ave., Los Angeles, Calif.

Northwestern Missouri Veterinary Medical Association. Maryville, Mo. January 8, 1935. Dr. E. S. Harrison, Secretary, Burlington Junction, Mo.

Pennsylvania, Conference for Veterinarians at University of. School of Veterinary Medicine, University of Pennsylvania, Philadelphia, Pa. January 8-9, 1935. Dr. G. A. Dick, Dean, 39th St. and Woodland Ave., Philadelphia, Pa.

Maine Veterinary Medical Association. Augusta, Maine. January 9, 1935. Dr. R. E. Libby, Secretary, Richmond, Maine.

Western Michigan Veterinary Medical Association. Grand Rapids, Mich. January 10, 1935. Dr. C. H. Haasjes, Secretary, 728 S. State St., Shelby, Mich.

Cornell University, Annual Conference for Veterinarians at. New York State Veterinary College, Ithaca, N. Y. January 10-11, 1935. Dr. W. A. Hagan, Dean, Cornell University, Ithaca, N. Y.

Oklahoma Veterinary Medical Association. Skirvin Hotel, Oklahoma City, Okla. January 14-15, 1935. Dr. C. H. Fauks, Secretary, 1719 S. W. 15th St., Oklahoma City, Okla.

Kansas Veterinary Medical Association. Topeka, Kan. January 16-17, 1935. Dr. Chas. W. Bower, Secretary, 1128 Kansas Ave., Topeka, Kan.

Ohio State Veterinary Medical Association. Columbus, Ohio. January 16-17, 1935. Dr. R. E. Rebrassier, Secretary, Ohio State University, Columbus, Ohio.

Colorado Veterinary Medical Association. Albany Hotel, Denver, Colo. January 17, 1935. Dr. J. C. Flint, Secretary, Colorado Agricultural College, Fort Collins, Colo.

Tennessee Veterinary Medical Association. Nashville, Tenn. January 21-22, 1935. Dr. A. C. Topmiller, Secretary, Department of Agriculture, Nashville, Tenn.

Wisconsin Veterinary Medical Association. Madison, Wis. January 21-23, 1935. Dr. B. A. Beach, Secretary, University of Wisconsin, Madison, Wis.

Michigan State College Short Course for Veterinarians. Michigan State College, East Lansing, Mich. January 21-25, 1935. Dr. Ward Giltner, Dean, Michigan State College, East Lansing, Mich.

Iowa Veterinary Medical Association. Fort Des Moines Hotel, Des Moines, Iowa. January 22-24, 1935. Dr. C. J. Scott, Secretary, Knoxville, Iowa.

Missouri Veterinary Medical Association and Special Course for Graduate Veterinarians. University of Missouri, Columbia, Mo. January 29-31, 1935. Dr. Ashe Lockhart, Secretary, 800 Woodswether Rd., Kansas City, Mo.

Nevada State Veterinary Association. Reno, Nev. January 30, 1935. Dr. Warren B. Earl, Secretary, Box 1027, Reno, Nev.

Illinois State Veterinary Medical Association. Leland Hotel, Springfield, Ill. February 19-20, 1935. Dr. C. C. Hastings, Secretary, Williamsville, Ill.

At Christmas play and make good cheer,
For Christmas comes but once a year.

THOMAS TUSSER.

PARTICIPATION OF BUREAU OF ANIMAL INDUSTRY IN LIVE STOCK ADJUSTMENT AND RELIEF MEASURES*

By JOHN R. MOHLER, *Washington, D. C.*
Chief, Bureau of Animal Industry
United States Department of Agriculture

Mr. Chairman, Members of the Institute, and Friends: On similar occasions in the past I have enjoyed the opportunity of discussing with you various lines of live stock research and regulatory work. The exchange of views on such questions has been beneficial, particularly in broadening our fund of information and acting as a stimulus for improved methods and procedures. I have felt at home in those discussions because the Bureau of Animal Industry has delved rather deeply into the sciences underlying such work.

Today I am asked to address you in a different rôle, essentially that of a relief worker. Moreover, the particular kind of relief work involved seems to have been compounded from a mixture of troubles from many sections of the country. The participation of the Bureau of Animal Industry in agricultural-adjustment and emergency programs has been a result chiefly of our having a field organization experienced in the handling of live stock and adaptable to emergency needs.

As many of you know, the Bureau is organized in a manner that permits great flexibility. Employes are transferred among administrative divisions and from one field station to another, when occasion demands. Besides the suitability of its field organization for special needs, the Bureau has been ready and anxious to lend its aid to help improve general economic conditions and especially to assist in combating the recent devastating drouth.

This special and emergency work may be divided into five major projects, namely, (1) augmented tick eradication, (2) an intensified drive against tuberculosis, (3) the inauguration of a field campaign against Bang's disease, (4) participation in drouth relief, and (5) special meat-inspection services. Parts of some of these projects were conducted at different times under varying authority and with funds from different sources. For that reason I shall deal with each of them as a composite project rather

*Address delivered before the Institute of American Meat Packers, Chicago, Ill., October 15, 1934.

than attempt to follow a chronological order. In coöperating with different federal agencies, we recognized that each agency was operating in accordance with its own established policies and was essentially the architect of its own plans. Therefore, though making some suggestions, the Bureau of Animal Industry served essentially as a contractor in carrying out assignments and supervising much of the physical work to see that specifications were followed.

Augmented Tick Eradication

The first special work likely to interest you, as packers, was taken up last winter in connection with the Civil Works Administration. That organization designated tick eradication as a Civil Works project giving promise of employing labor and requiring materials for construction. The Bureau readily accepted the offer of assistance from the CWA in the building and repair of dipping-vats. Since these vats have been aptly and properly called "canals to prosperity," it seemed desirable to accept labor and materials for this promising means of bringing more prosperity to the South. As a result of such assistance more than 4,000 dipping-vats were built or repaired. The CWA likewise furnished more than 100,000 gallons of arsenical dip, about 9,000 gallons of cattle-marking paint, and large quantities of barbed wire, spray-pumps, and other supplies. Our inspectors supervised the construction work and the use of the dipping material and sundry equipment during the active dipping season. Briefly, the designation of tick eradication as a Civil Works project, with the facilities furnished, has been a great stimulus to the campaign against cattle ticks.

Extension of Tuberculosis Eradication

The Civil Works Administration provided $170,000 for operating expenses in connection likewise with the campaign against bovine tuberculosis. Veterinarians paid from this fund tested nearly a million cattle in eight states. This was in addition to the normal progress of this work. Besides providing salaries, the funds were used for transportation and other expenditures largely local, thereby proving beneficial to localities where this work was conducted.

Later in the year, the Bureau of Animal Industry received from the Agricultural Adjustment Administration an allotment of $12,000,000, also for the eradication of tuberculosis. The purpose in this case was threefold: (1) To eradicate the disease, (2) to reduce the number of cattle in the United States, and (3)

to put money in the pockets of cattle-owners in all the 48 states.

The allotment was to be spent partly to pay the cost of testing but chiefly for indemnities. This large sum, now being used, is resulting in a huge volume of tuberculin-testing and the rapid eradication of tuberculosis even in localities where the disease was formerly strongly entrenched for many years. Considerably more than a million cattle are now being tested monthly, of which between 30,000 and 40,000 are reactors. The percentage of reactors is large for the reason that we are testing cattle in sections where the incidence of the disease is relatively high. In August more than 18,000 reactors were taken out of New York State alone, this number being more than half the total of reactors found in the United States during that month.

Drive Against Bang's Disease Inaugurated

The year 1934, though now known as the year of the great drouth, will probably become noteworthy also in the history of our agriculture as the year in which an active field campaign against Bang's disease began.

The Agricultural Adjustment Administration has made available $12,000,000 to enable the Bureau to combat this disease in a manner somewhat similar to the campaign against tuberculosis. Bang's disease has been causing the live stock industry losses estimated at about $50,000,000 annually, and cattle-breeders in particular have long sought relief from its devastating effect on their herds. The campaign against this malady began in July and has already extended to 22 states, with prospects that additional states will take up the work shortly. We are making progress in taking out a rather high percentage of reactors—an average of about 15 per cent, though the figure varies greatly in different localities.

This work will reduce the total number of cattle and improve the general health and condition of herds. Bang's disease is important principally from a cattle-breeding standpoint. It causes abortion, but seldom has an observable effect on the carcasses.

The owners of cattle reacting to an official test for Bang's disease are to receive compensation for the elimination by slaughter of these cattle. The payment in the case of grade cattle is not to exceed $20 and for purebred, registered cattle, the corresponding figure is $50. The owner in addition also receives the salvage obtained from the slaughter of the reacting animals. It is provided, however, that the total of all payments to the owner shall not exceed the appraised value. Cattle reacting to the Bang's

disease test are marketed after being properly tagged and branded. As these reactors do not require any extra postmortem examination or any special precautions, such as cleaning and disinfection, as is the case after the slaughter of reactors to the test for tuberculosis, these cattle properly should be marketed the same as any other cattle which are sold straight and should not be bought subject to postmortem inspection.

Owing to the newness of this activity, it is interesting to note the sentiment thus far regarding the Bang's disease campaign. Following are a few editorial comments that have appeared in agricultural and live stock journals. Here is one from Idaho:

> While a herd clean-up involves some little trouble and expense, it is regarded as virtually necessary and profitable in the long-run.

From Wisconsin comes this comment:

> Farmers who suspect the presence of Bang's disease in their herds are urged to make early application for the Government test.

After outlining the plan, the editor of a Massachusetts journal states:

> New England breeders thus have a splendid opportunity to participate in a clean-up movement which will prove advantageous to all.

These comments are typical of still others and indicate a rather auspicious beginning of an important new activity.

Drouth Relief

During the past summer, as you are aware, this country experienced the most severe and widespread drouth in its history. The federal government took prompt steps to meet the situation and made available a large fund for the purchase of cattle which owners were compelled to dispose of on account of lack of feed and, in some cases, also because of scarcity of water.

I have already referred to tick eradication in connection with Civil Works activities in the South. This year, in particular, tick eradication has been noteworthy for its assistance to stockmen in central and northern states. Though searing about a third of the agricultural and grazing land of this country, the drouth did not materially affect the Southeast. That area thus afforded a safe haven for about a million starving cattle from the Corn Belt and adjacent areas. I say a *safe* haven for the reason that the cattle ticks which formerly infested more than 500,000 square miles of territory in the South and Southeast—about four-fifths of the total—have ben eradicated. Formerly those pastures would have been deadly to northern cattle. This year

they were safe and we confidently expect them to be safe, as far as ticks are concerned, for all time to come. Thus, proverbial southern hospitality in receiving starving cattle of the central and northern states mitigated a great deal of animal suffering besides reducing financial loss.

The Bureau of Animal Industry's participation in drouth relief consisted partly in the assignment of experienced employes to conduct or aid in administering the relief. In addition, 1,200 veterinarians visited about 400,000 farms or ranches to inspect and classify the live stock. They also certified to the appraisals. One class of animals, unfit for food purposes because of emaciation or being too weak to be shipped, had to be condemned and destroyed outright. A second class of animals that were fit for food, or were considered strong enough to be transferred to regions of adequate grazing, were so handled. A third class, consisting of selected animals suitable for breeding, remained on farms where there was feed to sustain them or where arrangements could be made for the purchase of feed.

In connection with the great exodus of live stock to market or to good pastures, Bureau employes made inspections to see that the animals carried no contagious disease or harmful skin parasites and that they received proper care *en route* and at destination. This line of work was an extended form of the customary federal supervision over the interstate movement of live stock.

Up to the end of September, purchases of drouth cattle by the government had amounted to about 6,500,000 head. This number represents about one-third of the inventory on the farms from which the government purchased bovine stock. Purchases of sheep and goats in drouth areas began about the middle of September in response to requests for relief among sheepmen, largely in the West.

At this time I want to pay tribute to the energy and ability of the agencies—local, state and national—with which the Bureau was associated during drouth-relief work. Buying of cattle began about ten days after relief plans were formulated and checks began going out in less than a week later. This promptness did much to improve the morale of stockmen as well as to provide them with some cash very necessary during a most trying time.

Special Meat Inspection

Most of the work already mentioned had, as its culmination, a final inspection of the animals and the resulting meat, as well as the newly added duty of grading and storing hides and skins

as the property of the Government. These hides and skins will be held for months to come, with the view of supporting the hide market. In addition, our meat-inspection service was called upon to perform other special tasks. Last year it classified and then supervised the slaughter of about 221,000 piggy sows and more than a million pigs ranging from 71 to 100 pounds in weight. The service also supervised the condemnation and destruction for food purposes of more than 5,000,000 pigs which it classified as weighing between 25 and 71 pounds. Still another piece of work was supervision of the slaughter of 85,000 sheep of Navajo Indians, the Bureau also acting as custodian of the meat. In addition, the meat-inspection service supervised the slaughter of about 15,000 animals, principally swine, for the Civilian Conservation Corps. All this work, of course, was in addition to the customary inspections for the Army, Navy, federal hospitals and penitentiaries, and other regular departments of the government.

In connection with the distribution and use of so-called relief meat, there is an old psychology. Persons who receive food without cost are frequently suspicious or critical of its quality—more so than the majority of persons who buy similar goods at regular prices. Since the stamp or label signifying federal inspection commonly appears on the product as it reaches the consumer, federal inspection this year has played a somewhat new rôle. It has tended, we believe, to prevent dissatisfaction and unrest among the large number of persons receiving free food. Since the government is responsible for the wholesomeness and general quality of food on which it places its inspection marks, the packing industry is thus protected, in some measure, from a source of troublesome complaints.

As far as I am aware, the different lines of work described have gone forward in a manner generally satisfactory to the various adjustment and relief agencies, to coöperating industries, and to the public.

Relations Between Government and Business

Much has been said in recent years concerning government activities in relation to business. In the half-century that has elapsed since the Bureau of Animal Industry was established, it has had many contacts with business organizations, but as far as I am aware it has never intruded in any field of legitimate business. On the contrary, when Bureau discoveries have been the basis for new industrial improvements or enterprises, such as the adoption of methods to prevent ham souring, the manu-

facture of biological products, or of dips and disinfectants, the Bureau has aided interested business men in developing commercial production.

In these and other fields, including law enforcement, we have worked side by side with industry. There are times when business can benefit by help from various government functions, and also there are times when the government needs the physical equipment and trained personnel that commercial organizations provide. This year the railroads, stockyards, and your packing-plants have been vitally necessary in the conduct of the government's live stock programs. The canning and other processing of millions of pounds of meat, for instance, could not have been done without your experienced personnel and your modern packing facilities. So, instead of referring to government in business or business in government, I prefer to look upon these two necessary parts of our modern society not as competitors, but as a well-matched team, each working in the same direction and each pulling its share of the load. The events of the current year indicate clearly that business and government must learn to work together cheerfully, harmoniously and effectively. That is one observation I want to leave with you today.

Naturally, many of you are concerned with what the future may bring as a sequence to some of the work just mentioned. I believe that our live stock resources, though now somewhat depleted, are actually better and sounder than at any previous time.

There has been a considerable degree of purging and sacrificing, but, under the selective plan that was used, the average condition of herds with respect to their intrinsic quality and physical soundness has probably improved, notwithstanding the influence of temporary underfeeding. In Texas, for instance, the ranges are now comparatively free of animals affected with epithelioma, or so-called cancer eye. Animals so affected do not develop and fatten normally and are a liability in the herd. Nebraska has largely gotten rid of actinomycosis, the so-called lumpy-jaw condition.

Mention has been made already of tuberculosis and Bang's disease work. I am confident that stockmen who have worked with the government in keeping their herds free from the maladies mentioned will be more alert in dealing also with some of the lesser diseases and pests.

Government Gives Aid Individually

I believe also that an improvement has occurred in the morale of the live stock industry, especially in its attitude toward diffi-

culties too great to be met by individuals or small groups. Those who have looked upon the national government as austere or remote have found on the contrary that it is sympathetic and ready to give worthy citizens, in particular, a helping hand in time of need. During the drouth, farmers sometimes came to local meetings in a suspicious, yes, even a desperate mood. But on learning of the sincere desire of the government to provide prompt and tangible aid they realized that this is actually a government, of the people, by the people, and for the people, individually as well as collectively.

In the foregoing remarks I have referred principally to the features of live stock adjustment and relief conducted by the Bureau of Animal Industry. Most of this work has been done on a large scale that may perhaps give the impression of undue dominance. On the contrary, I repeat in closing that the part played by this Bureau was but a modest portion of a still larger undertaking planned and directed by other branches of the government. I understand that the directing heads or sponsors of those other agencies will address you also, thereby enabling you to obtain a view of live stock adjustment and relief in its entirety.

Horse and Mule Association

The annual meeting of the Horse and Mule Association of America will be held at the Palmer House, Chicago, Ill., December 5, 1934. Many interesting addresses will feature the program. Mr. John Torpey, of Grand Island, Neb., who has sold many thousands of range horses this season, will tell about the supplies west of Omaha. Mr. Grant Good, of Ogden, Iowa, who has sold 131 purebred draft horses since January 1, 1934, will speak on horse production in Iowa. Mr. L. P. McCann, extension animal husbandman, Ohio State University, will speak on multihitch work and colt shows in Ohio. Mr. H. C. Horneman, of Danville, Ill., whose Belgians have won more principal prizes this year than those of any other exhibitor, will tell why his faith in the horse business has led him to invest thousands of dollars in purebreds. Mr. C. J. Cronan, Jr., of Louisville, Ky., secretary of the American Saddle Horse Breeders Association, will discuss the tremendous increase in horseback riding, and the breeding of saddle horses.

Nature fits all her children with something to do.—JAMES RUSSELL LOWELL.

STUDIES ON COCCIDIOSIS VIII. IMMUNITY OR RESISTANCE TO INFECTION IN CHICKENS*

By ROY L. MAYHEW, *Baton Rouge, La.*
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An examination of the results of the experiments carried out by the Department of Parasitology of the Louisiana Agricultural Experiment Station reveals certain data on the subject of immunity and resistance to coccidiosis in chickens which, it is thought, will be of interest. The reader is referred to other papers by the writer for details on methods of rearing,[1-3] methods of inoculation,[1, 4] fecal examination[3] and source of stock.[5] Data are presented in the following pages on the following subjects:

1. Inherited immunity or resistance.
2. Practicability of immunity resulting from repeated infection.
3. Age immunity or resistance,

INHERITED IMMUNITY OR RESISTANCE

The source of the original stock was twelve hens belonging to the personal flock of the writer, which, together with the two generations of progeny, have supplied the baby chicks for the experiments, and have been under the personal observation and management of the writer during the four years of the experiments. Eight of the twelve "families" thus established have supplied too small a number of chicks, however, to be considered in the conclusions. An examination of table I shows a great difference in the percentage of hemorrhage and deaths of the different families, and suggests that it might be possible to isolate high-hemorrhage-and-death and low-hemorrhage-and-death "families" by making special matings. Much variation is observed in the results in the different generations, as is expected when small numbers are involved.

Due to lack of quarters, special matings have not been possible except in family 27, which has been very closely inbred. In the other families a large portion of the chicks have been from pen matings, hence it is not possible to study the results by sires as well as dams. No males from other flocks have been used, however, during the third and a portion of the second generation in any of the families. Since it has been necessary to dispose of the stock and discontinue this part of the work be-

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cause of financial reasons, this brief statement of the results as obtained is presented at this time.

Recent studies on resistance inheritance of interest in this connection are the work of Lambert and Knox,[6] on fowl typhoid, Roberts and Card,[7] on white diarrhea, Becker and Hall,[8] on coccidian infection in rats and Webster,[9] on *Bacillus enteritidis* in mice. For further references the reader is referred to the bibliographies in the above papers.

Practicability of Developing a Resistance by Repeated Infection

The writer's attention was first directed to this phase of the problem by the results reported by Johnson,[10] and by Tyzzer.[11] Space does not permit a review of the literature on coccidial immunity, but the reader is referred to the papers of Tyzzer, Theiler and Jones,[12] in chickens; Biester and Schwarte,[13] in swine; Wilson and Morley,[14] in cattle; Henry,[15] in the guinea pig, and Andrews,[16] in mammals. L. G. Taliaferro has reported on im-

Table I—*Summary of the results of the inoculations by "families" in percentage of the total number inoculated.*

		42	39	27	49
1st Generation	Dead	0.0	7.7	7.1	50.0
	Hemorrhage	20.0	0.0	28.6	0.0
	Infected	66.6	77.0	57.1	50.0
	Uninfected	13.3	15.3	7.1	0.0
	Inoculated	15	13	14	2
	Hens	1	1	1	1
2nd Generation	Dead	32.3	13.9	11.1	19.0
	Hemorrhage	44.1	30.2	48.1	35.7
	Infected	23.5	51.1	37.0	33.3
	Uninfected	0.0	4.6	3.7	11.9
	Inoculated	34	43	27	42
	Hens	7	5	6	5
3rd Generation	Dead	50.0	39.1	40.0	29.4
	Hemorrhage	33.3	39.1	40.0	54.9
	Infected	13.3	21.7	20.0	15.6
	Uninfected	3.3	0.0	0.0	0.0
	Inoculated	30	23	10	51
	Hens	7	7	8	12
Totals of All Generations	Dead	32.9	19.2	15.4	25.5
	Hemorrhage	35.4	26.0	42.3	45.7
	Infected	27.8	49.3	38.4	23.4
	Uninfected	3.8	5.4	3.9	5.3
	Inoculated	79	73	52	94
	Hens	15	13	15	18

munity to other protozoan parasitic infections,[17] and W. H. Taliaferro has reported on immunity to malaria in monkeys[18] and to *Trypanosoma lewisi* in rats and rabbits.[19]

An examination of table II shows that all the expected combinations of results were obtained in the repeated inoculations, there being hemorrhage following hemorrhage in five cases, hemorrhage following infection in 23 cases, seven instances where hemorrhage and death followed hemorrhage, seven where hemorrhage and death followed infection, and one instance (A910) in which the bird had three attacks of hemorrhage within approximately three weeks. Similar results were obtained in lots 23 and 25.

TABLE II*a*—*Summary of the results of repeated infections (lot 38).*

BIRD	INOCULATED		
	2-26-30	3-22-30	4-7-30
A879	+	+++	H
A868	+	+++	H
A880	+	+++	H
A852	+	HD	....
A884	H	HD	....
A873	H	HD	....
A871	−	+	HD

Note: Intervals between infections: 24 days and 16 days.
Key: D = Dead. H = Hemorrhage. + = Infected. — = Uninfected.

TABLE II*b*—*Summary of the results of repeated infections (lot 39).*

BIRD	INOCULATED			
	3-11-32	3-18-32	3-30-32	4-9-32
A902	H	H	++++	.....
A903	++++	.....	HD	.....
A905	+	+	HD	.....
A908	+	H	HD	.....
A910	H	H	H	+
A911	+	H	+	.....
A914	+	H	.....	+
A916	+	H	HD	.....
A917	+	+	HD	.....
A919	H	HD	.....	.....
A920	+	H	+	−
A922	+++	H	+	HD
A923	+	H	++	++++
A926	+	H	HD	.....

Note: Intervals between infections: 7 days, 12 days and 10 days.

The source of the infective material seems to have little effect on the results, since the material used for the inoculation of lot 39 on March 30 was their own droppings, and on April 9 from chickens inoculated from the birds of lot 39. The infective material used in the inoculation of lot 38 on March 22 was droppings from birds which had been inoculated from these in lot 38 at their previous attack.

It will be observed by referring to table II that inoculations were made at the following intervals: 7, 10, 12, 16, 24, 38, and 55 days. One additional case not included in the tables is of interest. Bird A824 was demonstrated to be infected by four fecal examinations during a period of five weeks. Three weeks after the last fecal examination, it died with cecal hemorrhage as a result of inoculation, the observations thus having extended over a period of 8 weeks.

TABLE IIc—*Summary of the results of repeated infections (lot 23).*

BIRD	INOCULATED	
	11–15–30	1–9–31
A164	+	H
A143	+	HD
A170	+	HD
A145	+	H
A149	+	H
A144	+	H
A173	H	H
A158	H	H
A154	+	H
A153	+	H
A157	+	H
A174	+	H

Note: Interval between infections: 55 days.

TABLE IId—*Summary of the results of repeated infections (lot 25).*

BIRD	INOCULATED	
	2–23–31	4–2–31
A 31	+	H
A 38	+	H
A 73	H	H
A 34	+	H
A120	+	H
A140	+	H

Note: Interval between infections: 38 days.

From these results the development of an immunity or resistance resulting from repeated infection offers little promise of being a practical means of protecting chickens from the disease. If the poultryman depends upon natural infection, it would be difficult to control the conditions so that an epizoötic would not develop with the resulting economic losses in deaths and retarded growth. If immunity in a practical way depends upon immunity to the various described species of coccidia, the difficulties to be overcome would be the maintenance of "cultures" containing the proper mixture of the various species and their proper administration.

Age Immunity or Resistance

It is a common belief among poultrymen that if chickens are successfully reared to the age of ten to twelve weeks, the danger from coccidial infection is past and that they then require less careful care and sanitation. A summary of the results of the inoculations made at ages of from four to 40 weeks is given in table III, from which it is evident that birds are susceptible at any of these ages. Two additional cases not included in the table are of interest. These were of natural infections in birds reared under the controlled conditions of the experiments conducted at this station to the age of 20 weeks. Pullet A413 was found dead with a typical case of coccidiosis at the age of 21 weeks, and bird A504 was observed to be suffering from a typical case of hemorrhage at the age of 25 weeks, but recovered.

From these results it appears that if the surrounding conditions are suitable for the sporulation, survival and ingestion of the oöcysts, birds are susceptible at least to the age of 40 weeks, and that poultrymen should not relax in preventive measures.

Summary

1. Evidence is presented which suggests the possibility of isolation of families or strains highly susceptible or slightly sus-

Table III.—*Distribution of the results of the inoculations according to the age of the chickens.*

Age in Weeks	Deaths		Hemorrhage		Infected		Negative		Total Inoculated
	No.	%	No.	%	No.	%	No.	%	
4–5	16	25.4	19	30.1	26	41.2	2	3.1	63
6	109	23.7	167	40.0	139	33.3	2	0.45	417
7–10	26	22.4	53	45.5	37	31.8	0	0.0	116
12–15	6	7.9	37	48.7	30	39.4	3	3.9	76
40	1	50.0	1	50.0	0	0.0	0	0.0	2

ceptible as indicated by the relative number of deaths and cases of hemorrhage.

2. The results of the inoculations of birds with previous history of infection indicate the lack of development of a protective resistance which can be made use of in a practical manner at the present time.

3. That an age immunity or resistance is not acquired is indicated by the development of typical cases of coccidiosis in birds inoculated at various ages between four and 40 weeks.

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Champion

A native of New Zealand claims to have set a world's sheep-shearing record. Mr. Percy de Malmanche, of Taranaki Station, sheared 412 breeding Romney ewes in ten hours. The best previous figure was 406 sheep.

Veterinary Record.

THE TYPES OF LEUCOCYTES IN MARKET MILK AS RELATED TO BOVINE MASTITIS*

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INTRODUCTION

The detection of mastitis is vital from a public health standpoint and is of importance to both the physician and the veterinarian. Many tests have been reported and used with varying degrees of accuracy. These tests, based on an increase of some constituent, appear to record successfully the presence of mastitis in individual animals. They also are of diagnostic value in testing market milk from highly infected herds. They do not, however, show the presence of infection in market milk from a herd where the number of infected animals is relatively small compared with the number of normal animals. The reason for this condition is that most of the tests for mastitis are based on an increase of some constituent found in normal milk, *e.g.*, chlorides, leucocytes, catalase, lactose, and hydrogen-ion concentration. When abnormal milk is mixed with normal milk, there is a dilution of the increased constituents of abnormal milk and these tests become less useful as the dilution increases. It is the purpose of this paper to set forth a method whereby mastitis can be detected in market milk.

HISTORICAL

Prescott and Breed,[1] in 1910, developed a method for the detection of body cells in milk. Newman[2] modified the staining procedure of the Prescott-Breed method. Varrier and Jones[3] reported on the types of leucocytes found in normal milk and from milk of cows having mastitis. Their method consisted of concentrating the cells by centrifuging and staining smears of the sediment by Jenner's method. Since that time (1924), Bourgeois,[4] Christiansen,[5] Bachmann[6] and Niemeyer[7] have used a similar technic in determining the types of leucocytes in milk. Prescott and Breed[1] reported normal leucocyte content of milk at 1,500,000 per cc, with "very few samples containing less than 100,000." Cherrington *et al*,[8] in 1933, set the index of mastitis at 100,000 leucocytes per cc; and Hucker,[9] in 1933, stated that over 150,000 per cc shows an abnormal condition. Scannell,[10] in 1912, in his

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†A part of the data for this study was secured while at the University of Idaho, Moscow, Idaho.

work referred to the cells as polymorphonuclear leucocytes. Austin and Van Slyke[11] developed a method for blood chlorides which was adopted for determinations of milk chlorides by Husband and Godden.[12] Hayden[13] perfected a field test for mastitis in which he concludes that over 0.14 per cent chlorides is indicative of mastitis. The use of gentian violet medium for the isolation and determination of streptococci in milk was reported by Bryan.[14]

Purpose of This Investigation

The various procedures cited in the foregoing references are, as previously stated, of diagnostic value for individual animals but of less value in testing market milk for mastitis. The method of Varrier and Jones is too complicated and requires too much time for use as a test for mastitis for market milk. It is the purpose of this paper to present data secured from a few of the present methods in comparison with data from a differential technic which is more delicate than the methods in use at the present time and yet much more simple than the Varrier-Jones method.

Plan of Procedure

The investigation was divided into (1) a preliminary study, using milk from individual animals, and (2) a study of market milk from various locations. During the preliminary investigation several present-day tests were performed simultaneously with the differential technic. In this study, cows from the University of Idaho dairy herd were the experiment animals. Determinations for leucocytes were made on milk from the individual quarters. The chloride determinations were made on milk from the combined quarters. Determinations of the blood chlorides were made for comparison with the milk chlorides. The determination of the causative or predominating organism was made on dextrose-enriched blood-agar.

During the study of tests for mastitis in market milk the investigation was divided into: (a) a study of the number of leucocytes, the types of leucocytes, and the chloride content of commercial dairies in Idaho and Iowa; and (b) the detection of the offending animals in a typical dairy.

Methods

Whitehorn's[15] method was used for the determination of blood chlorides in the preliminary study.

Two methods were used for the determination of milk chlorides. Austin and Van Slyke's procedure was used in the prelimi-

nary study. Hayden's field test for milk chlorides was run simultaneously with the quantitative test during the preliminary investigation and used exclusively for chloride determinations throughout the remainder of the study.

During the preliminary study, the Prescott and Breed method with Newman's staining technic was used in conjunction with the differential technic for the determination of leucocytes.

The technic for the determination of the number and types of leucocytes by the differential methods is as follows:

1. Smear 0.01 cc of milk over an area of 1 sq. cm. 2. Allow the smear to dry at room temperature. 3. Fix the smears in

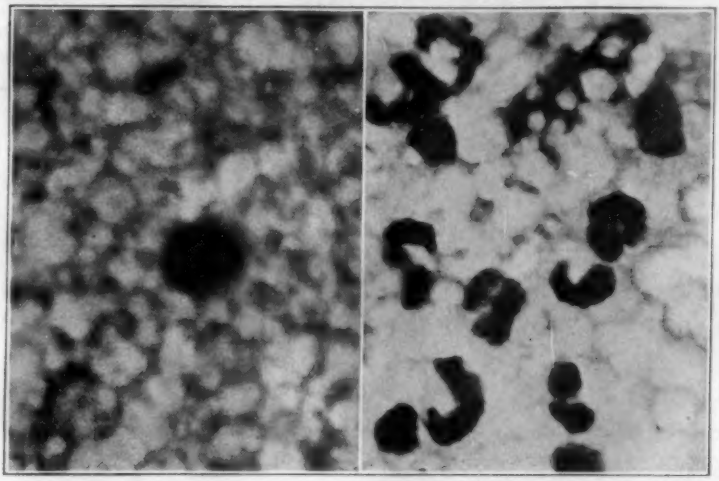

FIG. 1 (left). Photomicrograph of normal milk presenting a typical field showing one large lymphocyte (x 1500).
FIG. 2 (right). Photomicrograph of milk presenting a typical field encountered in milk smears from milk of cows affected with mastitis. Polymorphonuclear leucocytes and small lymphocytes are present (x 1500).

acetone-free methyl alcohol for two to three minutes. 4. Partially flood the smear with Wright's stain (0.3 grams of dry Wright's stain in 100 cc of acetone-free methyl alcohol) for one minute. 5. Add an equal amount of pH 6.2 buffer solution or distilled water acidulated to a pH of 6.2. Allow the stain to polychrome for three to five minutes. 6. Wash off the stain with a gentle stream of distilled water. It is preferable to apply the water from a wash-bottle as the preparation rests on the staining-rack. After all the excess stain is washed off, the preparation should be allowed to dry, without blotting, at room temperature. (The preparation appears much more distinctly if no fat solvent is used.) Observe the preparation, using the oil-immersion objec-

tive of a previously standardized microscope. Observe from ten to 50 "fields," depending inversely upon the number of leucocytes present. The number of leucocytes per cc is determined by dividing the total number of leucocytes seen by the number of fields observed; the quotient is multiplied by the factor of the microscope. Determine the percentage of each type of leucocyte by dividing the number of each type by the total number of leucocytes observed. A very convenient instrument for recording the number of fields, total leucocytes, and types of leucocytes is the

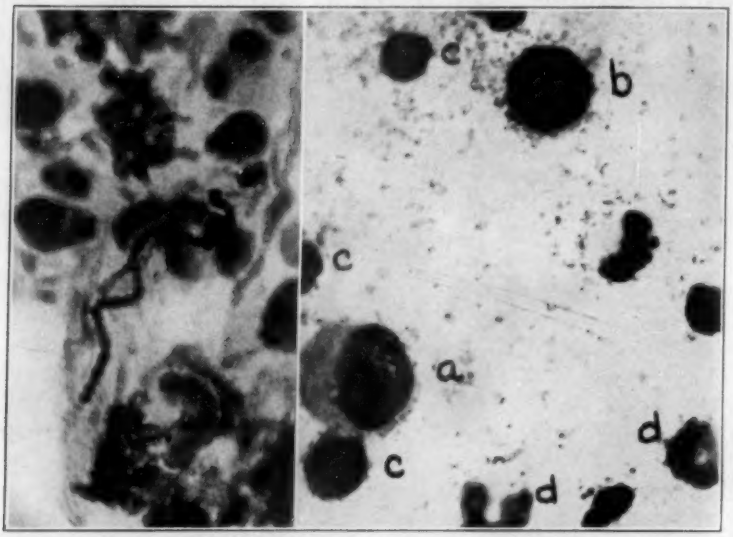

FIG. 3 (left). Photomicrograph of milk from an infected animal, showin a chain of streptococci with a background of numerous leucocytes (x 1500).

FIG. 4 (right). Photomicrograph of milk from an infected animal showing: a, a mononuclear leucocyte; b, a large lymphocyte; c, small lymphocytes; d, polymorphonuclear leucocytes.

Marbel Blood Calculator.* The casein stains very lightly. The nucleus of the polymorphonuclear leucocyte stains a deep purple, the cytoplasm staining slightly or not at all. The nuclei of the large and small lymphocytes take a purple stain and the cytoplasm stains light blue. The nuclei of the large mononuclear leucocytes stain purple and the cytoplasm is granulated and stains light blue.

The differential technic is workable on a smear of milk made either with an inoculating loop or by smearing a film on the glass slide with a cover-slip. By using this method the polymorphonuclear leucocytes can be detected and a diagnosis made, thus

*The Marbel Blood Calculator Co., 3267 S. Halsted Street, Chicago, Illinois.

eliminating the need for a Breed pipette or standardized loop. This method saves a great deal of time over the other method. It is necessary to place the three types of polymorphonuclear leucocytes together. The reason for this was the lack of cytoplasm staining in either the neutrophiles, basophiles or eosinophiles.

During the preliminary investigation dextrose-enriched blood-agar was used for the isolation of the causative or predominating organism. Bryan's[14] liver-infusion gentian-violet blood-agar was used for the isolation and counting of streptococci in part 2 of this investigation.

Experimental Results

Table I presents data secured during the preliminary investigation in which animals in high productivity were tested. The blood chlorides, milk chlorides, leucocytes per cc of milk, the types of leucocytes present in milk, and the causative or predominating organisms were studied.

Table II shows leucocyte content, chloride content, and types of leucocytes present in market milk. These data were obtained from 20 dairies in Idaho and Iowa.

Table III presents data from an above-average mid-western dairy herd. This table shows the effect of dilution by normal milk. The determinations found in this table should be correlated with the results for dairy 30 in table II.

Discussion

Preliminary study: Data from blood chloride determinations showed a range of 503.30 to 445.54 mg per 100 cc of blood. These figures come within the averages reported by Hayden and Fish[16] and Allardyce *et al.*[17] The average amounts found compare favorably with those reported by Anderson *et al.*[18] The blood chloride content in all cases except two (78 and 167) was above 470 mg per 100 cc of blood.

The milk chlorides showed a wide variation, ranging from 51.80 to 348 mg per 100 cc of milk. All normal cows showed milk chlorides below 140 mg per 100 cc of milk. In several instances the chloride content was below 140 mg in milk from cows having mastitis. Two factors were correlated with this condition. In one instance the blood chlorides were low (cow 167) and in the others the causative or predominating organism was a staphylococcus. Hayden's field test compared very favorably with the more complicated Austin and Van Slyke method.

The leucocyte content determinations, of milk from the various quarters, checked closely upon comparing the Prescott and Breed method with the differential method. Two smears were made,

TABLE I—*Data from normal and infected cows.*

Cow	Blood Chlorides (Mg per 100 cc of Blood)	Milk Chlorides (Mg per 100 cc of Milk) Austin-Van Slyke	Milk Chlorides Hayden Field Test—0.1%	Leucocytes per cc Newman's 3rd Method				Leucocytes per cc Differential Technic				Polymorphonuclear Leucocytes (%)				Small Lymphocytes (%)				Large Lymphocytes (%)				Mononuclear Leucocytes (%)				Causative or Predominating Organism
				Quarter				Quarter				Quarter				Quarter				Quarter				Quarter				
				R.F.	R.H.	L.H.	L.F.	R.F.	R.H.	L.H.	L.F.	R.F.	R.H.	L.H.	L.F.	R.F.	R.H.	L.H.	L.F.	R.F.	R.H.	L.H.	L.F.	R.F.	R.H.	L.H.	L.F.	
168	503.30	59.30	-	22,000	44,000	11,000	22,000	44,000	44,000	22,000	22,000	0	0	0	0	100	0	0	88	0	100	100	80	0	0	0	0	None
166	470.29	74.10	-	44,000	44,000	11,000	44,000	44,000	44,000	22,000	44,000	0	0	0	0	100	100	0	100	0	0	100	0	0	0	0	0	"
198	495.06	51.80	-	11,000	11,000	11,000	22,000	22,000	22,000	44,000	44,000	0	0	0	0	100	100	100	100	0	0	0	0	0	0	0	0	"
167	470.29	89.00	-	22,000	88,000	88,000	22,000	44,000	88,000	88,000	88,000	0	0	0	0	100	100	50	0	0	0	50	100	0	0	0	0	"
156	486.79	74.10	-	44,000	44,000	44,000	88,000	44,000	22,000	44,000	132,000	0	0	0	0	100	0	0	66+	0	100	100	33+	0	0	0	0	"
176	478.54	59.30	-	44,000	22,000	88,000	11,000	44,000	11,000	11,000	11,000	0	0	0	0	0	100	100	100	100	0	0	0	0	0	0	0	"
178	470.29	74.10	-	11,000	44,000	22,000	44,000	22,000	44,000	44,000	44,000	0	0	0	0	100	0	100	100	0	100	0	0	0	0	0	0	"
89	486.79	126.00	-	11,000	22,000	44,000	88,000	88,000	88,000	44,000	44,000	0	0	0	0	100	100	100	100	0	0	0	0	0	0	0	0	"
2x	478.54	118.50	-	88,000	44,000	22,000	44,000	88,000	88,000	44,000	44,000	0	0	0	0	100	0	100	0	0	100	0	100	0	0	0	0	"
4x	486.79	126.30	-	44,000	22,000	44,000	88,000	44,000	44,000	44,000	66,000	0	0	0	0	100	50	100	66+	0	50	0	33+	0	0	0	0	"
9x	486.79	118.50	-	88,000	Blind	44,000	88,000	88,000	Blind	88,000	88,000	0	8	0	0	75	8	100	75	25	8	0	25	0	0	0	0	"
96	478.54	200.00	+	748,000	836,000	1,120,000	3,872,000	748,000	880,000	1,220,000	3,850,000	88	90	78	80	0	10	10	0	6	0	0	8	6	0	12	12	Streptococci
88	470.29	148.00	+	748,000	968,000	88,000	2,552,000	924,000	1,232,000	176,000	2,156,000	48	64	25	52	24	32	75	12	19	4	0	16	9	0	0	18	"
91	478.54	170.50	+	220,000	264,000	1,584,000	836,000	264,000	396,000	1,320,000	924,000	100	77	66	76	0	23	9	5	0	0	16	11	0	0	9	6	"
78	448.54	348.00	+	4,972,000	7,612,000	1,144,000	9,240,000	5,060,000	7,700,000	1,144,000	9,460,000	70	86	67	83	10	0	28	4	5	0	9	3	15	14	9	10	"
82	478.54	140.70	+	220,000	132,000	264,000	8,184,000	396,000	352,000	616,000	6,248,000	78	78	72	90	11	0	7	3	0	0	0	0	11	22	21	7	"
83	478.54	155.50	+	88,000	176,000	1,320,000	44,000	88,000	176,000	1,540,000	44,000	0	50	60	0	50	50	20	100	50	0	20	0	0	0	0	0	"
87	486.79	140.70	+	132,000	88,000	792,000	1,408,000	264,000	132,000	836,000	1,056,000	66+	100	55	75	33+	0	25	0	0	0	5	8	0	0	15	17	"
93	478.54	170.50	+	44,000	88,000	44,000	2,464,000	176,000	2,200,000	176,000	2,640,000	75	100	75	66	25	0	25	17	0	0	0	8	0	0	0	9	"
15x	478.54	140.70	+	22,000	11,000	22,000	308,000	22,000	22,000	22,000	396,000	0	0	0	80	100	0	100	0	0	100	0	10	0	0	0	10	"
164	478.54	148.00	+	88,000	132,000	88,000	6,336,000	88,000	176,000	88,000	7,700,000	50	50	0	85	50	25	0	6	0	25	100	3	0	0	0	6	"
187	448.54	51.80	-	3,432,000	396,000	484,000	660,000	2,308,000	572,000	616,000	572,000	82	65	79	72	2	15	7	0	9	15	7	7	7	15	7	21	"
18x	470.29	118.50	-	88,000	440,000	1,120,000	3,975,000	88,000	440,000	1,056,000	5,060,000	0	80	80	80	100	20	0	4	0	0	0	4	0	0	20	12	Staphylococci
160	478.54	118.50	-	440,000	176,000	1,364,000	22,000	440,000	176,000	1,540,000	44,000	90	50	74	100	10	0	12	0	0	50	0	0	0	0	14	0	"
159	470.29	98.50	-	44,000	132,000	748,000	44,000	88,000	396,000	1,020,000	66,000	75	45	76	88	25	11	16	50	0	33	4	0	0	11	4	25	"
13x	470.29	111.0	-	880,000	264,000	88,000	22,000	880,000	308,000	88,000	44,000	90	85	25	0	5	15	75	100	0	0	0	0	5	0	0	0	"

and one was stained by each method. There was some variation in results but this was very slight when the microscopic factor was taken into consideration. The leucocytes were more distinct in the differential preparations, thus facilitating a more rapid examination. The leucocyte content of milk from normal quarters was usually below 100,000 per cc, while milk from all infected quarters was over 100,000 per cc. The cases in which the leucocyte content bordered on 100,000 would be very difficult to diagnose without further evidence. For that reason "border line" cases might be termed normal.

The picture presented by the differential stain was very interesting. The only types of leucocytes encountered in milk from normal quarters were large and small lymphocytes. In no case were polymorphonuclear or mononuclear leucocytes encountered in normal milk. The types of leucocytes found in milk from infected quarters always showed polymorphonuclear leucocytes and in addition mononuclear leucocytes and large and small lymphocytes. According to these data, the presence of polymorphonuclear leucocytes in milk, no matter how low the leucocyte content, always indicates mastitis. By dilution with normal milk,

TABLE II—*Data from milk of 20 Idaho and Iowa dairies.*

Dairy	Milk Chlorides (Hayden Field Test)	Leucocytes (Differential Technic)				
		Number (per cc)	Polymorphonuclears (%)	Small Lymphocytes (%)	Large Lymphocytes (%)	Mononuclear Leucocytes (%)
1	−	484,000	76	20	0	4
2	−	88,000	55	25	20	0
3	−	308,000	64	28	4	4
4	−	2,860,000	80	12	0	8
5	−	484,000	70	20	5	5
6	−	176,000	50	45	5	0
7	+	132,000	60	20	20	0
8	−	88,000	10	60	30	0
9	−	88,000	30	60	10	0
10	−	836,000	76	12	12	0
11	−	308,000	70	15	15	0
12	−	132,000	40	30	30	0
13	−	88,000	30	40	30	0
14	−	484,000	60	30	10	0
15	−	44,000	20	50	30	0
16	−	132,000	30	50	20	0
17	−	220,000	50	30	20	0
18	−	168,000	50	20	30	0
19	−	56,300	0	50	50	0
20	−	280,000	65	5	30	5

TABLE III—*Data from dairy 20.*

Cow	Composite of Quarters: Milk Chlorides (Hayden Field Test)	Composite of Quarters: Leucocytes (Differential Technic): Number (per cc)	Polymorphonuclears (%)	Small Lymphocytes (%)	Large Lymphocytes (%)	Monocytes Leucocytes (%)	Quarter	Individual Quarters: Milk Chlorides (Hayden Field Test)	Leucocytes (Differential Technic): Number (per cc)	Polymorphonuclears (%)	Small Lymphocytes (%)	Large Lymphocytes (%)	Monocytes Leucocytes (%)	Organisms (Bryan Technic): Streptococci (per cc)	Other Organisms (per cc)
1	+	392,000	50	20	10	20	RF	+	1,360,000	80	0	10	10	700	100
							RR	+	504,000	55	20	10	15	500	0
							LR	+	280,000	45	20	30	5	400	100
							LF	+	224,000	50	30	20	0	100	0
2	-	28,000	0	80	20	0	RF	-	14,000	0	0	100	0	0	0
							RR	-	56,000	0	50	50	0	0	100
							LR	-	28,000	0	100	0	0	0	100
							LF	-	42,000	0	60	40	0	0	0
3	-	14,000	0	100	0	0	RF	-	7,000	0	100	0	0	0	100
							RR	-	28,000	0	50	50	0	0	200
							LR	-	14,000	0	100	0	0	0	100
							LF	-	14,000	0	100	0	0	0	0
4	+	1,680,000	54	32	2	12	RF	+	9,320,000	64	14	10	12	6,000	0
							RR	+	504,000	50	20	20	10	4,500	100
							LR	+	784,000	60	20	10	10	500	0
							LF	+	1,064,000	70	20	5	5	1,400	200
5	-	18,600	0	100	0	0	RF	-	14,000	0	100	0	0	0	0
							RR	-	28,000	0	100	0	0	0	100
							LR	-	56,000	0	100	0	0	0	0
							LF	-	7,000	0	50	50	0	0	200
6	-	14,000	0	50	50	0	RF	-	14,000	0	0	100	0	0	800
							RR	-	28,000	0	50	50	0	0	100
							LR	-	14,000	0	100	0	0	0	0
							LF	-	7,000	0	50	50	0	0	0
7	-	28,000	0	70	30	0	RF	-	14,000	0	100	0	0	0	0
							RR	-	28,000	0	0	100	0	0	500
							LR	-	56,000	0	100	0	0	0	1,000
							LF		Blind						
8	-	448,000	60	20	10	10	RF	+	784,000	55	25	10	10	100	0
							RR	+	1,624,000	70	15	10	5	500	100
							LR	-	14,000	0	50	50	0	0	200
							LF	-	168,000	20	50	30	0	100	0
9	+	896,000	60	10	20	10	RF		Blind						
							RR	+	1,680,000	65	15	10	10	900	100
							LR	+	1,586,000	70	10	10	10	1,000	0
							LF	+	560,000	50	35	10	5	700	0
10	+	784,000	70	20	0	10	RF	+	1,624,000	60	25	5	10	300	0
							RR	+	1,120,000	75	20	0	5	600	0
							LR	+	392,000	45	35	20	0	400	0
							LF	+	1,344,000	65	20	5	10	700	0
11	-	14,000	0	50	50	0	RF	-	7,000	0	50	50	0	0	0
							RR	-	28,000	0	0	100	0	0	0
							LR	-	14,000	0	50	50	0	0	300
							LF	-	21,000	0	50	50	0	0	200
12	+	8,400,000	90	2	0	8	RF	+	5,600,000	70	20	0	10	1,400	0
							RR	+	31,920,000	90	0	0	10	12,300	200
							LR	+	336,000	60	30	10	0	1,000	0
							LF		Blind						

all other tests become useless, due to the fact that they are based on the increase of some constituent of normal milk. Consequently, the differential leucocyte test appears to be the most valuable method for the detection of mastitis in examining market milk.

The data secured on normal and abnormal animals compared favorably with the results of Varrier and Jones.[3] The greatest differences might be attributed to the leucocyte classifications used. The results secured in this investigation varied from the results of Bachmann.[6] The variation in results was due, undoubtedly, to the animals chosen as normals. Many of the animals used as normals by Bachmann produced milk with a leucocyte content far in excess of 100,000 per cc.

Investigation: Table II presents data secured from market milk of 20 typical dairies. Milk chloride tests, by Hayden's method, leucocyte content determinations, and differential leucocyte determinations, were made on this milk. Six dairies produced milk with a leucocyte content below 100,000 per cc. All other dairies produced milk with leucocyte contents above 100,000 per cc. According to the index suggested by Cherrington *et al*, 14 of these herds would have mastitis present. The Hayden field test, however, detected only one herd with mastitis. The differential determinations for leucocytes showed that milk from 19 dairies contained polymorphonuclear leucocytes.

According to the conclusions drawn from data presented in table I, all herds, with the exception of one (19), had some mastitis infection. The reason for the variation in results obtained from the three tests was undoubtedly due to the dilution of chlorides and leucocytes in the abnormal milk by the addition of normal milk.

Table III presents data secured from a mid-western dairy. This dairy produced a seemingly high quality product. The herd was composed of twelve high-quality animals. This table presents clearly the effects of dilution of normal milk upon the increased constituents found in milk from cows having mastitis. The differential technic appears to detect, through milk determinations, the presence of bovine mastitis.

SUMMARY

This study is an investigation of the blood chlorides, milk chlorides, leucocyte content, differential leucocyte content, and the causative or predominating organisms found in bovine mastitis. In the preliminary investigation, tests were made on blood and on milk from the individual quarters of 26 cows. Eleven

cows were normal and 15 were infected with mastitis. Blood chloride levels did not generally appear to be affected by the disease. The milk chloride content was increased in streptococcic infections, with the exception of cow 167, which had a low blood chloride content. Milk chloride content from cows having mastitis caused by staphylococci appeared to be normal. The leucocyte content of milk from quarters of normal cows was usually below 100,000 per cc, while the content from infected quarters was over 100,000 per cc. Polymorphonuclear and mononuclear leucocytes were detected only in milk from infected quarters. Small and large lymphocytes were the only types of leucocytes found in normal milk.

A study was conducted on market milk to determine the relative efficiency of chloride determinations, leucocyte content determinations, and differential leucocyte determinations in order to detect mastitis. According to Hayden's method, one of the herds had mastitis infection, while according to results secured with the differential technic using the index suggested by Cherrington *et al*, 14 herds had some mastitis. The results secured by the differential technic for the types of leucocytes present indicated that 19 herds had some cows infected with mastitis.

A dairy was chosen to determine the number of infected animals in the herd. This dairy herd, according to Hayden's method, was free from mastitis, but according to the differential leucocyte technic, the milk had over 100,000 leucocytes per cc and polymorphonuclear leucocytes were found also, thus indicating mastitis.

The individual quarters of each of the cows in this herd were tested for chloride content, leucocyte content, types of leucocytes, and the causative or predominating organism. The data secured indicated that half of the animals had some mastitis. All three tests recorded the same conditions on individual quarters. The chloride tests made on milk from the combined quarters showed five infected animals, while the determinations of leucocyte content and types of leucocytes revealed six infected animals.

CONCLUSIONS

According to data secured in this investigation the following conclusions are drawn:

1. *Milk chlorides:*
   (a) Hayden's field test compares favorably with the method of Austin and Van Slyke.

(b) Hayden's method is effective in detecting milk from infected quarters, from animals that are highly infected, and from herds that are highly infected.

(c) Hayden's method does not detect milk coming from cows having mastitis caused by staphylococci.

(d) Dilution by normal milk of the excess chlorides found in milk from infected animals makes this test useless for the detection of market milk from infected herds.

2. *Leucocyte content:*

(a) A leucocyte content of 100,000 per cc of milk as reported by Cherrington *et al* usually indicates mastitis.

(b) Leucocyte content determinations of milk smears prepared by the differential technic were more easily read than those prepared by the Prescott-Breed method.

(c) Dilution of abnormal milk by normal milk may decrease the leucocyte content in market milk to such an extent that a true index will not be shown.

3. *Types of leucocytes:*

(a) Small and large lymphocytes were the only types of leucocytes found in normal milk.

(b) Polymorphonuclear leucocytes, mononuclear leucocytes, and small and large lymphocytes were found in milk from cows having mastitis.

(c) Polymorphonuclear leucocytes are not a constituent of normal milk; therefore, their presence even in small numbers is indicative of mastitis.

(d) The differential method is more delicate than the Hayden or the Prescott-Breed method in detecting mastitis.

(e) The differential technic is simpler to operate than is the method used by Varrier and Jones.

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Dog Poetry Contest

The annual dog poetry contest, sponsored by the Judy Publishing Company, of Chicago, Ill., is under way, and the 1934 award will be made early in 1935. Entries, which must be mailed, must be received at the Judy Building, 3323 Michigan Blvd., Chicago, on or before December 31, 1934. They should be addressed to the Dog World Annual Dog Poetry Award.

Any number of entries may be submitted by one person, but they must be original and unpublished. They must be typewritten and carry the name and address of the contestant on the upper right-hand corner of the first page. There are no limitations on the length of the poem or the form of the verse, except that it must be in English. First prize is $25; second prize, $10; 3rd prize, $5; and seven prizes of $1 each, for the ten best poems respectively. Manuscripts will not be returned.

Judges for the 1934 contest are: Dr. D. M. Campbell, editor of *Veterinary Medicine;* Richard H. Little, of the *Chicago Tribune;* and Capt. Will Judy, editor of *Dog World.* The judges will base their awards approximately upon the following percentages: technic and poetic ability, 30 per cent; thought and sentiment, 30 per cent; expression and phrasing, 40 per cent.

The purposes of this award are to create interest in dogs, to foster sentiments of kindness and appreciation for all dogs, and to give recognition to the ever-increasing field of dog literature.

A MICROFILARIA IN THE BLOOD OF CATTLE*

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The idea that bovine filariasis occurs only in tropical and subtropical countries is common. This belief has undoubtedly been the reason for the lack of interest in the study of bovine filariasis in general and of microfilariae in particular in the United States. Some studies on infection with filariae have been reported in this country, yet they are few and scattered and for the most part only case reports.

The microfilaria to be reported in this paper was found accidentally while examining a blood film prepared from a bovine for a differential leucocyte count. The supra-vital technic[1] had been used in the preparation of this specimen. Blood subsequently taken from the same animal always revealed microfilariae. Since bovine filariasis has not been described as occurring in Wisconsin and since it has seldom been reported in the United States, the writer decided to study a relatively large number of cattle for the incidence of the infection.

LITERATURE REVIEW

In reviewing the literature it is evident that the order *Filarioidea* includes a large number of forms, which are parasitic in vertebrates and are chiefly characterized by having lips, which are paired and lateral in position, when present. The females are usually very prolific, and either produce thick-shelled eggs containing embryos at the time of oviposition (*Spiruridae*, *Gnathostomidae*, etc.) or are viviparous or ovoviviparous (many *Filariidae*). The *Filarioidea* possess an important biological distinction from almost all other nematodes, in that, in all species whose development is known, an intermediate host is required for the larval stages. Among the *Filariidae*, in all the species whose life-history has been elucidated, part of the development takes place in some kind of a blood-sucking insect, which transmits the larvae to a fresh host; while among the *Spiruridae* the general rule appears to be for the larvae to develop in some arthropod, or other small animal, preyed upon by the final host.

The family *Filariidae* includes forms that are parasitic in practically all domestic animals. Four different genera belonging

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to this family are found infecting cattle. Of these the most widely distributed is the genus *Setaria*, which includes two species, S. *labiato-papillosa* (Alessandrini, 1838[2] = *Filaria cervina*, 1845[3]; and *S. marshalli*, Boulenger, 1921[4]). Only the female of the latter has been recorded.

The species *S. labiato-papillosa* occurs chiefly in the peritoneal cavity in the ox, African buffalo and various species of deer and antelopes. Filarids found in the eyes of horses have been referred to this species, but the determination is open to question.[5] During spraying operations, Repp, of Iowa,[6] observed this species in the peritoneal cavity and ovaries of young cows and thought of them as playing no pathogenic rôle. Garino[7] also isolated this species in Italy from small tumors on the muscular part of the diaphragm; the adults were also found in the aponeurotic, costal arch and renal capsule. In all, they were observed in 100 cases of adult cattle. Fantin[8] found *S. labiato-papillosa* in the small intestine of a steer and referred to them as being non-pathogenic. Corveri[9] also refers to *S. labiato-papillosa* as producing no disease in the ox. Purvis[10] found the characters of this species variable, and attempted to show that *Setaria digetata*, von Linston, is a synonym of *Setaria labiato-papillosa*. Inflamed areas were found in the peritoneum of the infected animals, produced by the adult filariae. The microfilariae of this species appear in the blood and are sheath forms. The intermediate host of this species is unknown.

Several species of the genus *Onchocerca* have been described in cattle. The best known of these species is *O. gibsoni* (Cleveland and Johnston, 1910[11]) which causes subcutaneous nodules in the ox and zebra. This species is found in the Malay region and Australia. The nodules are found in greatest numbers along the brisket, but may also be found along the neck and rump. The worms are viviparous; the microfilariae are without sheaths and do not circulate in the blood, but are found in nodules. Leiper[12] concluded that *O. lienalis* was identical with *O. gibsoni*. Mahommed[13] found that the adults of this species move about freely, producing embryos for some time before the commencement of tumor formation. The worm becomes immobilized a part at a time until finally it is entirely encysted.

Onchocerca lienalis (Stiles, 1892[14]) has been recorded in the capsule of the spleen, and in the gastro-splenic ligament of the ox in the United States and Australia. The embryos are without sheaths.

Onchocerca bovis Piettre, 1912[15] occurs in the connective tissues in the ox. This species does not form nodules.

Onchocerca gutturosa Newman, 1910[15] occurs in the cervical ligament of the ox in northern Africa and Australia. The embryos are without sheaths.

Onchocerca armillata Railliet and Henry, 1909[14] forms sinuous galleries in the lining of the aorta of the ox, zebu and buffalo. It occurs in Sumatra, the Malay States, Indo-China and India. The microfilariae are without sheaths.

Cordophilus sagitta Monning, 1926[15] occurs chiefly in certain African antelopes, but is also recorded in the ox in Portuguese East Africa. It is found in the heart (either encysted among the muscles or free in the ventricles) and pericardium. The worm is viviparous, and the microfilaria are sheathless.

Elaephora poeli (Vrijburg, 1897) Railliet and Henry, 1912[15] is a parasite of cattle and buffaloes, and is found in Indo-China, the Malay Peninsula, Sumatra and the Philippines. The male is found in nodules, in the wall of the aorta, while the female occurs with its anterior end buried in the nodules and its posterior portion hanging free in the lumen of the vessel. The embryos are slightly swollen at the anterior end and tapered posteriorly.

Davis[16] describes microfilariae in a Sudanese ox as measuring 300 microns by 7.5 microns (living); fixed films, 240 microns by 4.5 microns. They showed a distinct nocturnal periodicity, twelve times as great at night as at midday.

The family *Dracunculidae*[14] should perhaps be included here as it contains certain aberrant forms, possibly belonging to the *Filarioidea*. To this family belongs the genus *Dracunculus* Richard, 1759[15] including *D. medinensis* (Linnaeus, 1758[17]) commonly known as the "Guinea-worm" and the reputed "fiery serpent" of the children of Israel.[18] The host of this parasite is said to include not only man, but the ox, horse, dog, jackal, leopard, baboon and cobra.[19] Leiper,[20] in a discussion of the "Guinea-worm" in domestic animals, attempts to show that they are able to infect and attain maturity in nearly all domestic animals. The microfilariae are without sheaths and are discharged through an ulcer, when the affected part comes in contact with water.

The Cattle Studied

The herds used for this experiment were all separate units maintained by the University of Wisconsin. Herd 1 was composed of 36 animals, 14 of which have been maintained at this Station since 1926[21] for the study of contagious abortion. This herd has been strictly isolated until about two years ago, when a number of animals were introduced from herd 3, and again

about a year ago when another group of young heifers was brought in from different parts of Wisconsin. Their quarters are situated about two miles from those of the other herds under observation.

Herd 2 made up of 22 animals has been maintained for a study of Holstein-Angus crosses, for a number of years. This herd has been strictly isolated in that no new animals were brought in until in April, 1932, when two Angus cows were added. Herd 2 is housed only a short distance from herd 3 and, when pastured, separated only by a fence on some occasions.

Herd 3 numbers over 100 animals. Two years ago, several animals were brought in from different parts of the state to replace those animals infected with contagious abortion, which were removed. Since that time no outside animals have been added.

Methods and Materials

A number of methods have been recommended for the concentration of microfilariae found circulating in the blood. Among these may be mentioned that suggested by Smith and Ravis.[22] They recommended bleeding 1 cc of peripheral blood into 10 cc of a 1 per cent solution of acetic acid, spreading the sediment upon slides, examining in the moist state or after fixing and staining. Todd and Sanford[23] also recommended a similar procedure.

The method finally decided upon and used throughout this experiment differs somewhat from those reviewed, yet they are essentially the same in that all are directed toward the laking of the red blood cells. Approximately 10 cc of blood were drawn from the external jugular vein, by means of a bleeding-needle, into a tube containing 1 per cent of a saturated solution of sodium citrate. The blood was immediately placed in the ice-box, or broken down and examined in the moist state. To secure an average number of microfilariae per cc of whole blood, 3 cc of citrated blood was mixed in a centrifuge-tube with 13 cc of distilled water. This mixture was centrifuged at 1,000 revolutions per minute for five minutes. After centrifuging, a small amount of opaque sediment accumulated in the bottom of the centrifuge-tube. If the erythrocytes were not all laked, it was necessary again to add distilled water and centrifuge. Further washing with distilled water appeared to toughen the sediment and prevented proper spreading when the cover-slide was applied. After the final centrifugation, the supernatant fluid was withdrawn and all of the sediment removed by means of a pipette to a slide, com-

pletely covered with a 24x50-mm cover and spread out by pressure applied with the thumb or a pencil. The slides were examined thoroughly in the moist state under a low-power objective. The microfilariae, if present, were seen lashing their way about in the sediment.

By this technic, it is possible to arrive at an estimate of the number of filarial embryos per cc of whole blood. The accuracy of this method is somewhat decreased by the small amount of sediment adhering to both the bottom of the centrifuge-tube and to the pipette.

Incidence of Infection

The venous blood of exactly 159 animals was examined once for microfilariae, and 78 of these were studied on two or more occasions to check the technic. No animal showed infection in the second examination that did not in the first.

In table I are shown the number of animals in each herd, the number infected and the percentage infected. It will be noted that four of the 36 animals in herd 1 were infected (11.11 per cent). Out of 22 animals in herd 2, two (9.99 per cent) were infected. Of the 101 animals in herd 3, six (5.94 per cent) showed infection. Out of the total of 159 animals examined, 12 (7.54 per cent) were found to be infected. The percentage of infection in each herd and also that of the total number of animals examined points to the conclusion that this is a common infection within the herds studied. Further, it gives some evidence that filariasis is common in the dairy herds of Wisconsin.

Table I—*The incidence of infection in the various herds.*

Herd	Animals Examined	Infected	
		No.	%
1	36	4	11.11
2	22	2	9.99
3	101	6	5.94

In table II the infected cows are identified and the number of embryos per cc of blood for each animal on three different dates is recorded. These animals were bled about 8:10 a. m. on the dates given and therefore any distinct variation in the number of organisms found should be considered as a true variation in the number per cc circulating in the venous blood instead of being attributed to periodicity.

It will be seen from table II that the animals from herd 1 showed some variation in the number of microfilariae from time

TABLE II—*The number of microfilariae per cubic centimer in the blood of each animal on three different dates.*

HERD	ANIMAL	MICROFILARIAE PER CC		
		3-29-32	5-13-32	7-12-32
1	13B	4	3	8
	14B	10	12	1
	18	5	35	15
	23A	25	13	7
		5-7-32	6-7-32	7-1-32
2	92A	25	47	40
	101A	3	4	1
		5-2-32	6-30-32	7-1-32
3	Agatha	5	6	5
	Bella	3	1	0
	Fair Maid	28	25	47
	Josephine's heifer	5	8	9
	Priscilla	194	150	153
	Sally	13	16	32

to time. Animal 13B remained constant for the first two examinations, but showed a distinct increase in the last. The picture presented by 14B is similar to that of 13B, except a decrease is noted on the last observation. Animal 18 showed variation in the number of larvae from one observation to another, while 23A showed a gradual decrease.

The two animals in herd 2 also showed some variation in the number of microfilariae. Animal 92A showed a distinct increase in number of organisms in the second and third observations, while 101A showed a decrease in the last.

Turning now to herd 3, we note that the infection in the blood of Agatha appears to have remained constant for the three observations. Bella showed only a slight infection in the beginning and on the last examination showed none. From the table the degree of infection with microfilariae in this individual is shown to be very small. If this could be used as a criterion to determine the number of adult filariae found within the body of this animal, the conclusion that only a small number of adults exist there might be drawn. Concluding that only from one to three female filariae are present within the body of this animal, the suspension of embryo production might have ceased for a time, or the number decreased to such an extent that they could not be demonstrated by the technic used here. There is also the possibility that the adults have died, due to the natural or

acquired resistance of this individual or for other unknown reasons.

Fair Maid appears to have remained almost constant in number of filarial embryos for the first two examinations, but showed an increase in the last. Josephine's heifer showed a slight upward trend in infection. Priscilla remained fairly constant throughout, but showed a decrease in the last two examinations. Sally remained fairly constant for the first two examinations with a sudden increase in the last.

The range in the number of microfilariae per cc, as shown by table II, is from 1 to 194 per cc of blood. Six of these animals might be classed as having a low, two as having a medium, three as having a high, and one as having a very high infection. Distinct variation in the number of microfilariae for the period studied was observed in two-thirds of the animals examined, while the remaining one-third was found to be nearly constant. These variations from time to time possibly may be due to the difference in the number of embryos produced by the adult female and their entrance into the blood-stream.

History of Infected Cows

Of the four infected animals in herd 1, two were introduced from outside sources, one from herd 3, while the fourth was an original member of this herd, which it will be recalled was established six years before this study was undertaken. The infected individuals in both herds 2 and 3 are progeny of individuals within their respective herds.

The history of each infected individual is as follows: Animals 13B and 14B, both approximately two and one-half years old, were placed in herd 1 in August, 1931. These animals were purchased from the same herd along with two others which have not shown the infection up to the present time. It is not known whether these animals were infected before placing them in herd 1, but this possibility cannot be eliminated. Animal 18, about eight years old, was one of the original members of herd 1. If this animal was infected when placed in the herd, it appears that at least one or more of the older animals which have remained in the herd since the beginning of this experiment could be expected to show the infection; however, this has not been found to be true. Animal 23A, now about five years old, was placed in this herd two years ago from herd 3, and again in this instance it is not known whether she was infected at that time, although the possibility remains.

Animal 92A, now slightly over three years of age, and 101A, about two and one-half years of age, both in herd 2, are offspring of individuals within the group. The only possible explanation of infection in this herd, unless the beginning nucleus was infected, would be from some outside source, probably from herd 3 by an exchange brought about through blood-sucking parasites while in pasture or from one barn to the other as they are only a short distance apart. The infected animals of herd 3 are also progeny of individuals within the group. The approximate ages of the infected animals in this herd are as follows: Agatha, four years; Bella, two and one-half years; Priscilla, five years; Fair Maid, four years; Sally, four years; and Josephine's heifer, approximately one year.

When first found infected, Josephine's heifer was ten months old. The time required for the development of this parasite from the larval to the adult stage is not definitely known, but is thought to require months. If this length of time is required for development, this animal must have become infected at an early age. The infection probably took place in the summer or fall of 1931.

Herd 3 may have become infected from individuals that were introduced two years ago and that have been eliminated since, or again, might have become infected by some outside source. From the ages already given of the affected individuals, one would expect animals of almost any age to be subject to the disease.

Periodicity

Mason[24] noted the phenomenon of periodicity in *Microfilaria bancrofti* and found that they usually appeared in greater numbers in the circulation during the night. For this reason they are said to have a nocturnal periodicity. They were found in the greatest numbers between ten o'clock in the evening and two o'clock in the morning. The microfilariae of *Loa loa* also show periodicity[25] and are present in greatest numbers in the peripheral circulation during the day, appearing in the blood only about eight o'clock in the morning and disappearing about nine o'clock at night. Davis also found periodicity[16] in a Sudanese ox.

To determine whether an increase or decrease occurred in the number of microfilariae in the blood of these infected animals, eight were selected from two herds and bled at four different periods during the day. The blood was then examined for any change in the number of embryos. The blood was drawn from the external jugular vein.

The results of this study are presented in table III, which shows that all these animals exhibited a slight variation in the number of microfilariae. The variation was not enough in any instance to lead one to believe that the microfilariae increased greatly in number during either the day or the night, but rather within the limits of normal variation.

As already stated, the blood taken from the eight animals studied was drawn from the external jugular vein. Apparently any increase in number of microfilariae in the peripherial circulation should at one time or another cause a similar increase in the external jugular vein. In order to check this point, one animal (Priscilla) was selected and bled from the ear and once from the external jugular vein during a 19-hour period.

The results of this study are presented in table IV, from which it may readily be seen that no distinct increase or decrease in the number of microfilariae occurred in the peripheral circulation any time during the period. This table also shows that at 5:00 p. m. the concentration of embryos in the venous blood was nearly equal to that in the peripheral blood drawn at the same time. From the comparison of the data in tables III and IV, it appears that the number of filarial embryos circulating in the venous blood was practically the same as that in the peripheral blood.

TABLE III—*A study of the variation of the number of microfilariae in the venous blood for four examinations during a period of 24 hours.*

ANIMAL	MICROFILARIAE PER CC			
	5 A. M.	12 NOON	5 P. M.	12 MIDNIGHT
Agatha	5	5	3	5
Bella	0	0	0	0
Fair Maid	56	47	47	51
Josephine's heifer	9	10	12	11
Priscilla	137	153	154	130
Sally	35	30	45	45
92A	43	33	41	39
101A	4	2	2	3

TABLE IV—*A study of the variation in the number of microfilariae in the peripheral blood of one animal at four periods during the same day.*

TIME BLED	5 A. M.	12 NOON	5 P. M.	5 P. M.	12 MIDNIGHT
Source	Ear	Ear	Ear	Jugular	Ear
Microfilariae per cc	158	144	150	160	170

Morphology

With a low-power objective, these microfilariae in the living state are seen as exceedingly active thread-like bodies with transverse striations. With the higher-power objective and by careful observation, the microfilariae can be seen to be inclosed within a sheath. The majority of the unstained larvae present a clear area containing from three to four large, round, dark bodies extending from the middle toward the posterior extremity and for about one-fourth of the length of the individual. Very little definite structure other than already mentioned can be determined in the living or dead unstained specimen. When fixed

Fig. 1. Microphotograph of a microfilaria fixed and stained with Wright's stain, showing three clear spaces in the cell structure and the granular area extending from the middle toward the posterior extremity (x 460).

with heat or dried and fixed in methyl alcohol and stained with Wright's stain or with hematoxylin, more of the definite structure can be determined. The embryo is found to be inclosed within a sheath. The head is rounded and appears to be almost transparent. The tail is distinctly pointed. The body of the larva is composed mainly of exceedingly small cells. There is a clear space between the cells about one-sixth of the entire length of the body from the head. A short distance posterior to this clear space, another space is found which is somewhat V- or U-shaped. Extending from the middle toward the posterior extremity for about one-fourth of the entire length of the body, an area containing tiny, reddish-staining granules can be seen when stained

with Wright's stain. A short distance from the end of the tail, another small clear area is visible. In general, these larvae appear to resemble those of *Microfilaria bancrofti* to a marked degree.

Photomicrographs were taken of two microfilariae, one stained with Wright's stain and the other with hematoxylin. These embryos were selected from a large number of stained mounts and on the basis of details shown for the entire group. With Wright's stain, the larger details such as clear spaces in the cell structure and the granular mass were found to be brought out more clearly, while with hematoxylin the cell structure was shown more clearly.

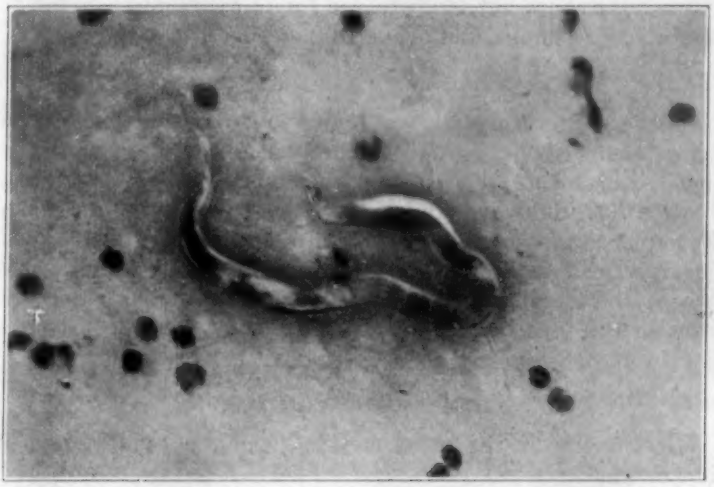

FIG. 2. Microphotograph of a microfilaria fixed and stained with hematoxylin, definitely showing the sheath and also showing the cell structure more in detail (x 460).

Measurements were taken of 40 microfilariae, five from each of eight different animals, in the moist, unstained state and soon after death, before any decomposition or any noticeable shrinkage had taken place. The embryos were from material treated and concentrated by the method described earlier. Measurements were made, in microns, of the length and width of the sheath, and of the length and width of the larvae. The means and standard deviation for the four measurements are given in table V. The values of the standard deviation for each measurement show that the variations in each set are small and may be accounted for by random sampling alone. The measurements of the larvae

TABLE V—*Average measurements with and without sheaths.*

DIMENSION	AVERAGE (μ)	STANDARD DEVIATION OF SET (μ)
Length of sheath	312.02 ± 0.96	9.00
Width of sheath	9.02 ± 0.10	0.98
Length of larva	279.53 ± 1.06	9.99
Width of larva	6.92 ± 0.08	0.76

of each animal show practically the same values as those of the entire group.

These microfilariae were found to be quite resistant. They will survive at ice-box temperature for 72 hours, at room temperature about 48 hours, and about 16 hours on a moist smear.

PROBABLE CLASSIFICATION

From the literature already reviewed of the genus *Onchocerca*, it was found that the known microfilariae in the grouping were unsheathed forms[15]; those of the genus *Dracunculus* were discharged into the water and were without sheaths,[14] and those of the genus *Setaria* were sheathed forms and appear in the blood.[14] The larvae described here were found circulating in the bloodstream and were sheathed forms which presumably should place them in the genus *Setaria*. They are very probably the microfilariae of *Setaria labiato-papillosa*.

SUMMARY AND CONCLUSIONS

Microfilariae in the blood may be demonstrated by concentration methods.

The herds observed showed a high incidence of infection. This infection is probably common in the cattle of this state.

The number of microfilariae in the blood may vary from time to time.

Animals of different ages were found to be infected.

The source of this infection is not known.

The larvae showed no periodicity and appeared in the venous and peripheral blood in almost equal numbers. They are sheathed forms and are fairly uniform in size.

These microfilariae are probably the larval stage of *Setaria labiato-papillosa*.

ACKNOWLEDGMENTS

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course of the experiment; to Dr. C. A. Herrick, for the identification of the first microfilaria found and his guidance throughout the course of the experiment, and to Dr. M. R. Irwin for his many helpful suggestions and coöperation during the experiment and organization of the data. Dr. B. A. Beach has aided greatly in bleeding a part of the animals. Mr. G. M. Werner and staff and Mr. A. B. Chapman and staff have also aided greatly in giving their consent to bleed the animals and in coöperating while bleeding them.

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Veteran Horse Dies

"Old Tom," a veteran horse of the Spanish American War, died recently at the age of 42. He was buried with full military honors.

THE PATHOLOGY OF COCCIDIOSIS IN THE DOG*

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Evidence has gradually accumulated showing the occurrence of coccidiosis in the dog. It is probable that the disease is nearly universal in distribution in the United States, but in many sections of the country it has not been reported, probably because of failure to make routine fecal examinations. As in most parasitic diseases, the greatest losses are lack of thrift and lowered vitality of the parasitized animal but in heavy and repeated infestations severe symptoms result. A survey of all dogs brought to the Veterinary Pathology Department for fecal examinations during the years 1920-1931, inclusive, shows that 13.8 per cent of the animals harbored coccidia. In localities where routine fecal examinations are consistently practiced by veterinarians, the percentage reported is even greater.

The morphologic characteristics of the three reported species of the genus Isospora *(Isospora bigemina, Isospora rivolta, Isospora felis)* parasitic in dogs have been well described. One species of Eimeria *(Eimeria canis)* has been rather vaguely reported. Relatively little is known of the physiology and pathology of the coccidia found in dogs.

Throughout the course of this study, 24 dogs, 6 cats, 5 foxes and numerous guinea pigs and rabbits have been used. All dogs used were from three weeks to three months of age, with the exception of two dogs which were about one year old when they were placed on experiment. The cats were from the same litter and were about six weeks of age. The foxes were about eight weeks old.

The animals were kept under carefully controlled sanitary conditions, housed in steel cages and with no possibility of contact. The animals were fed a commercial dog feed, consisting of inspected horse meat and cereals. The water given them to drink was taken from the hot-water tap, except in summer, when it was necessary to use water heated to 75° F. Although the animals used were of the short-haired species, it was necessary at times to wash the rear parts with soap and water to prevent fecal matter from clinging to them. At least one susceptible control animal was kept in the room at all times during the experiment and only in one instance did the control become accidentally infected.

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During the course of the experiment daily fecal examinations were made of all animals. None of the animals was infected at the time they were acquired, as was determined by three successive daily fecal examinations. The method used in making fecal examinations was the modified Sheather method described by Benbrook (1929), which is a sugar flotation method. Unless otherwise stated, the oöcysts were incubated in 2 per cent potassium dichromate solution in a room where the temperature ranged from 27 to 32° C. Before the oöcysts were fed they were washed free from the preservative by centrifuging in tap water three times. All cultures were aerated at least twice daily from 3 to 10 minutes by passing air from a compressed air apparatus through a tube into the bottom of the solution. As the water was lost from the cultures by evaporation more was added so that the concentration of potassium dichromate was kept at approximately 2 per cent.

The culture of coccidia from a dog designated as culture A came from a 4-month-old Boston terrier presented at the veterinary hospital, Iowa State College, for treatment of a severe diarrhea of five days duration. Microscopic examination of the culture by sugar flotation showed it to be a rich culture of a single species of Isospora, showing an average of ten oöcysts per low-power field.

Culture B was of dog origin, obtained from Kansas City, Missouri, from a Chow dog eight months of age, entered at a small-animal hospital for treatment for epileptiform attacks. The oöcysts were not present in large numbers, but were sufficiently numerous so there was no difficulty in finding them for observation after centrifuging.

Culture C was obtained from several dogs in the Iowa State College veterinary hospital. The oöcysts were not present in large numbers.

Culture D was obtained from a field case of canine coccidiosis at Erie, Illinois. This was a very rich culture. A large part of the study was done with this culture or subcultures from it. It contained three species of Isospora of canine origin. Microscopic examination of this culture by the modified Sheather method showed an average of 20 oöcysts per low-power field.

Culture E was obtained from a composite sample of fox feces submitted to the Veterinary Pathology Department for diagnosis. This was a rather lean culture, containing about five oöcysts per low-power field, of apparently two species of the genus Isospora.

Culture F was obtained from a clinical case of coccidiosis of a cat presented to the veterinary hospital, Iowa State College, for treatment. It was a rich culture containing a single species of genus Isospora. Microscopic examination by the modified Sheather method showed an average of ten oöcysts per low-power field.

Culture G was obtained upon autopsy of a dog suffering from distemper. It was a rich culture containing approximately ten oöcysts per low-power field by direct microscopic examination.

Identification of Cultures

It was noted that all the oöcysts in culture A appeared to be of the same shape and showed only a slight variation in size. Measurements were made of 100 consecutive oöcysts as they appeared on the slide. They ranged in size from 8 to 15 microns in length by 7 to 11 microns in breadth, with an average size of 10 by 8 microns. They were ellipsoidal in shape.

To determine the rate of sporulation, part of the culture was placed in 2 per cent potassium dichromate solution and incubated at a temperature of 29 to 30° C. During the first 24 hours, sporulation had proceeded to a point where there were two well-formed sporoblasts. During the next 24 hours, a few sporocysts developed. At the end of 72 hours, many oöcysts contained sporozoites and a residual body. There was no indication of a micropyle. The sporocyst had a rather thick double-contoured wall. The oöcyst wall was more delicate and was closely wrapped around the sporocysts. This species was definitely identified as *I. bigemina* (fig. 1).

Culture B was identified as *I. bigemina*, the oöcysts measuring 9 to 15 microns long by 7 to 11 microns broad, with an average of 10 by 8 microns. Culture C also was identified as *I. bigemina*.

Upon examination of culture D, it was found that there was a great variation in the size of the forms observed. The largest form measured 31 to 47 microns in length by 24 to 37 microns in breadth, with an average of 36 by 28 microns. They were ovoid. The intermediate form measured 17 to 24 microns in length by 16 to 20 microns in breadth, with an average of 20 by 17 microns. They were distinctly oval in shape. The smaller form measured 8 to 16 microns in length by 7 to 11 microns in breadth, with an average of 10 by 8 microns. This culture was placed in a 2 per cent solution of potassium dichromate and incubated at room temperature (29 to 31° C.). After 24 hours, sporocysts had devel-

oped in the small forms; after 48 hours, a few sporozoites had formed in the small form and sporocysts in the larger form; after 72 hours, a few sporozoites were formed and, at 96 hours, nearly all oöcysts examined were fully sporulated. The largest form of Isorpora in culture D produced two thick-walled sporocysts, each containing four sporozoites and a large residual body. The sporozoites appeared more rounded at one end and here contained a large refractile body. These were identified as *I, felis* (fig. 3.). The intermediate-sized Isospora showed two sporocysts which were more elongated than those of the other species and each contained four sporozoites and a large residual body filled with globules. A micropyle was observed occasionally at the pointed end. This species was identified as *I. rivolta* (fig. 2). The small species in this culture was identified as *I. bigemina,* already described from culture A.

The culture known as culture E from silver foxes was obtained primarily for cross-infection experiments. It was a mixed culture of Isospora, containing approximately 5 oöcysts per low-power field. The oöcysts were variable, one resembling *I. bigemina* in size and shape. The measurements were 12 to 17 microns in length by 9 to 11 microns in breadth. The other form resembled *I. felis,* measuring 25 to 40 microns in length by 25 to 30 microns in breadth. This large form corresponds to *Isospora canivecolis.* No attempt has been made to name the smaller form, as this study was primarily concerned with Isospora species as they exist in dogs (fig. 4).

Culture F was a rich culture identified as *I. felis,* measuring 31 to 47 microns in length by 24 to 37 microns in breadth. It was obtained from a cat which was used in cross-infection experiments.

Culture G was a lean culture identified as pure *I. bigemina.*

Table I shows some of the morphologic and physiologic characteristics of the three species of Isospora.

TABLE I—*A comparison of some morphologic and physiologic characteristics of three species of genus Isospora affecting dogs.*

NAME	AVERAGE LENGTH (μ)	AVERAGE BREADTH (μ)	RESIDUAL BODY	TIME FOR SPORULATION	SHAPE	OOCYST WALL
Isospora bigemina	10	8	None	96 hours	Ellipsoidal	Regular
Isospora rivolta..	20	17	In spore	96 hours	Ellipsoidal	Regular
Isospora felis....	36	28	In spore	96 hours	Ovoid	Regular

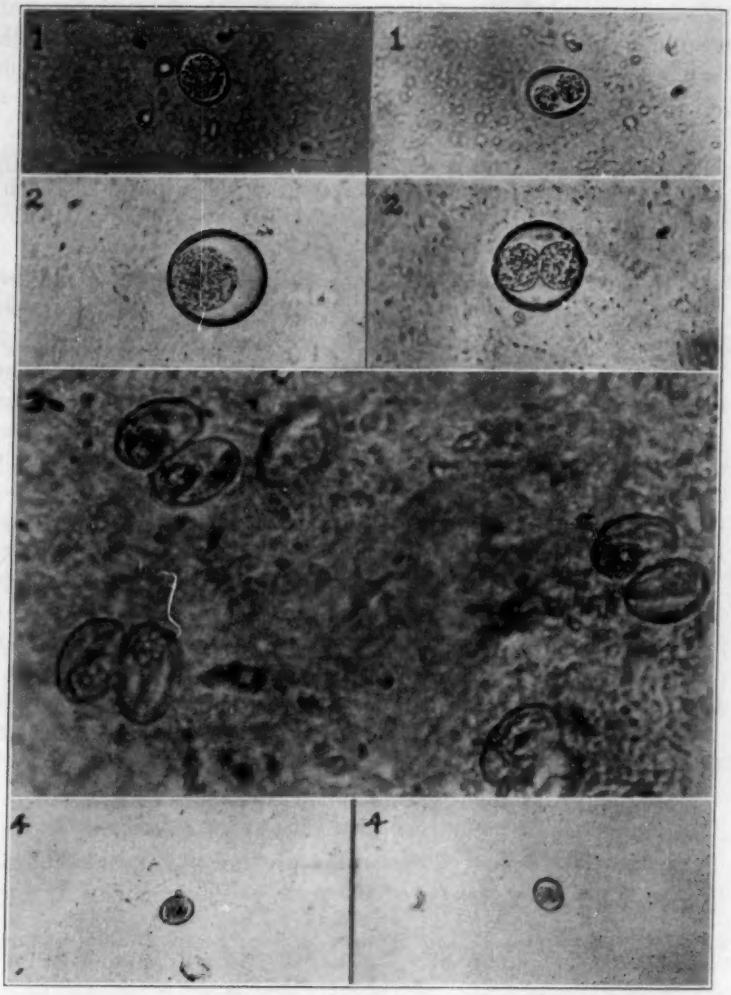

FIG. 1. Oöcyst and sporocyst, *Isospora bigemina* (x 385).
FIG. 2. Oöcyst and sporocyst, *Isospora rivolta* (x 385).
FIG. 3. Free sporocysts, *Isospora felis* (x 765).
FIG. 4. Isospora of fox (x 385).

Cross-Infection Experiments

Dogs: Four apparently healthy dogs about two months of age were examined daily for four successive days and were found free from coccidia. Dog 1 was given 20 cc of sporulated culture F *(I. felis)* which was of feline origin. It contained approximately 3,000 sporulated oöcysts per cc. The inoculum was given by means of a stomach tube. Six days after inoculation, symptoms of bloody diarrhea occurred which continued until the eleventh day. Oöcysts were observed in the feces first on the eighth day and were present until the 29th day.

Dog 2 was given 15 cc of a freshly sporulated subculture E (not specifically named). The inoculum contained approximately 2,500 sporulated oöcysts per cc. Inoculation was made by means of a stomach-tube. Four days after inoculation, profuse bloody diarrhea appeared. Oöcysts were observed in the feces on the eighth day and continued until the twelfth day. No oöcysts were found from the twelfth to the 17th day. Oöcysts again appeared in large numbers on the 18th day and continued until the 47th day. This experiment was conducted on two more dogs with a subculture of E with similar results. Oöcysts were not passed after the 21st day.

Dog 3 was given 25 cc of a sporulated culture of *Eimeria perforans* and *Eimeria stiedae.* This culture was obtained from domestic rabbits. This was a heavy culture containing 20 sporulated oöcysts per low-power field. Fecal examinations were made from the fourth to the 30th day but no oöcysts were observed.

Twenty-five cc of a sporulated culture of *Eimeria tenella* from chickens was given to dog 4. Fecal examination from the fourth until the 30th day failed to show oöcysts and no symptoms appeared.

Rabbits: Two young rabbits raised in the laboratory were given 10 cc of sporulated culture B *(I. bigemina)* of dog origin. The culture contained approximately five oöcysts per low-power field. Fecal examinations were made daily from the fourth until the 30th day but no oöcysts appeared.

Guinea pigs: Two young guinea pigs raised in the laboratory were given 10 cc of sporulated culture C *(I. bigemina).* This culture contained approximately five oöcysts per low-power field. Fecal examinations daily from the fourth to the 30th day failed to show oöcysts.

Cats: Two apparently healthy cats of about three weeks of age were used. Fecal examination on four successive days failed to show any coccidia present. On the sixth day, from the time

the cats were placed in the cages, each received 10 cc of sporulated culture A *(I. bigemina)*. A count of this culture by means of a hemocytometer showed approximately 1,000 oöcysts per cc. The inoculum was administered by means of a metal syringe equipped with a small rubber tube which extended about two inches into the esophagus. On the third day after inoculation, cat 1 showed a slight catarrhal diarrhea. From the fourth to the sixth day, the feces were streaked with blood; the symptoms subsided on the seventh day and had completely disappeared by the ninth day. Daily fecal examinations were made and oöcysts appeared on the sixth day and continued until the 28th day. Cat 2—symptoms appeared on the second day after inoculation in the form of a catarrhal diarrhea. This increased in severity and from the third until the ninth day inclusive the cat was passing feces composed principally of blood. The symptoms gradually subsided until the 14th day when the animal appeared normal. Daily examination of the feces showed that oöcysts were first passed on the fifth day, increasing in number on the sixth day and reaching the height of elimination on the seventh day. Oöcysts were passed until the 25th day. This experiment was repeated with similar results.

Two healthy cats (3 and 4), six weeks of age, were given 15 cc of sporulated culture E, a culture of silver fox origin. The culture contained about 800 oöcysts per cc. The method of administration was the same as heretofore described. Cat 3 began showing slight diarrhea on the fourth day and on the fifth and sixth days the feces were slightly streaked with blood. The symptoms subsided by the ninth day. Oöcysts appeared in the feces on the seventh day and were found daily until the 15th day. This culture was a mixed culture of a large and a small Isospora from a fox. Only the small form appeared in the feces. Cat 4 showed no symptoms, but oöcysts appeared in the feces on the tenth day and were observed daily until the 27th day. These were also of the small form. As this culture was of fox origin the experiment was repeated with similar results.

Foxes: The ranch-raised foxes (1, 2 and 3) in this experiment were about eight weeks of age.

Fox 1 was given 15 cc of sporulated culture A *(I. bigemina)* containing approximately 1,000 oöcysts per cc. On the fourth day, symptoms of diarrhea were noticed and on the seventh and eighth days the feces were tinged with blood. Oöcysts appeared on the seventh day and were observed in the feces until the 21st day.

Fox 2 was given 10 cc of sporulated subculture D *(I. bigemina, I. rivolta, I. felis)*. The culture contained approximately 700 sporulated oöcysts per cc. Two days after inoculation, a profuse bloody diarrhea appeared, which lasted until the sixth day. *I. bigemina* oöcysts appeared in the feces on the fifth day, *I. rivolta* oöcysts appeared on the seventh day, and *I. felis* oöcysts appeared on the tenth day. Symptoms were observed until the 13th day. Oöcysts were eliminated in the feces until the 31st day.

Fox 3 was used as a check. This experiment was again conducted with similar results.

Effects of Some Disinfectants

Freshly collected oöcysts of *I. bigemina, I. rivolta* and *I. felis* were treated with disinfectants as shown in table II. In all cases the fecal débris was removed by successive centrifuging so that the oöcysts would be exposed directly to the action of the disinfectant. Table II shows three trials with four different cultures and also the percentage of viable oöcysts on examination 72 hours later. The temperatures at which the experiment was conducted ranged from 29 to 32° C. Ninety to 95 per cent of sporulation may be considered as ineffective disinfection, because ordinarily 5 to 10 per cent of the oöcysts are sterile.

Table II—*Effects of some disinfectants.*

	Time of Exposure											
	72 Hours			1 Hour			20 Minutes			10 Minutes		
Trial	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd
Phenol (%)	1	2	3	5	10	15	10	5	1	10	20	25
Sporulated (%)	0	0	0	75	3	0	85	90	90	95	95	95
Liq. cresolis comp. U.S.P. (%)	1	2	3	5	10	15	10	5	1	10	20	25
Sporulated (%)	0	0	0	0	0	0	60	70	80	80	75	75
Mercuric chlorid (%)	0.1	0.2	0.3	0.3	0.4	0.5	0.7	0.8	0.9	0.3	0.5	0.6
Sporulated (%)	0	0	0	0	0	0	60	60	60	70	60	50
Formalin (%)	10	10	10	10	10	10	10	10	10	10	10	10
Sporulated (%)	0	0	0	0	0	0	25	20	22	30	27	28
Copper sulfate (%)	2	1	3	2	4	5						
Sporulated (%)	50	75	40	85	75	75						

Effect of Putrefaction

It has been observed frequently, in working with coccidia, that putrefaction, especially when blood is present in the feces, kills the oöcysts in a short time. This was observed in several cases where oöcysts were collected from animals with a bloody diarrhea. Freshly collected fecal material containing oöcysts was placed in two bottles, and to each sample was added 5 cc of dog blood. After adding 2 per cent potassium dichromate solution to one sample, both samples were refrigerated for a few days. Both cultures were removed from the refrigerator and kept at a room temperature of about 30° C., and 2 per cent solution of potassium dichromate was added to the putrefied sample. After 21 days, only about 35 per cent of the oöcysts in the culture originally without preservative were viable, whereas about 75 to 80 per cent of the other culture showed viability. When the same procedure was followed entirely at a temperature of 30° C., only 20 per cent of the culture originally without preservative were viable, while the culture originally with preservative showed about 95 per cent viability.

Effect of Temperature

Maximum temperature: Fresh nonsporulated samples of culture D *(I. bigemina, I. rivolta, I. felis)* were subjected to heat in a water-bath for ten minutes at temperatures indicated in table III. After heating, an equal volume of 2 per cent potassium

Table III—*Effect of maximum temperature upon viability of mixed Isospora* oöcysts (ten-minute exposure).*

Temperature (° C.)	First Trial (%)	Second Trial (%)	Third Trial (%)
80	0	0	0
75	0	0	0
70	0	0	0
65	0	0	0
55	0	0	0
50	60	61	58
45	70	75	74
40	85	84	88
55	0	0	0
54	0	0	0
53	0	0	0
52	0	0	0
51	41	40	40
50	60	61	58

*Culture D (*I. bigemina, I. rivolta, I. felis*).

dichromate solution was added and the cultures were put in the incubator at a temperature of 37.5° C. for sporulation. The only change noticed in the microscopic appearance was a shrinking of the oöcyst wall in those heated to 80° C. for ten minutes. Some oöcysts developed to the sporocyst stage even at 52° C., but no sporozoites were formed. This experiment was conducted four times with similar results. Cultures incubated at room temperatures of 29 to 30° C., and cultures incubated at 37.5° C. showed very little difference in sporulation time.

Minimum temperature: Fresh subcultures of culture A *(I. bigemina)* were placed in the refrigerator for two days at a temperature of 80° C. Portions of the culture were removed to the incubating room at 30° C. for development. Observations of the development were made after 72 hours of incubation. The culture was in 2 per cent potassium dichromate solution. A development of about 75 per cent resulted, which is a decrease of 20 per cent below the room-temperature experiments.

January 21, 1932, a sporulated culture containing three species of Isospora was placed out of doors. The exposure was made at very fluctuating temperatures from -12° F. to 60° F. This culture was examined on March 21, 1932, and the only microscopic change noted was swelling and a spongy-like appearance of the outer oöcyst membrane. The culture was fed to dog 7 on March 22. No change was noted in the animal for 21 days.

A nonsporulated culture exposed at the same time and under the same conditions showed about 5 per cent sporulation after incubation for 96 hours at 30° C.

Effect of Sunlight and Drying

A 24-hour nonsporulated specimen of culture A was placed in four open Petri dishes. Two of these were placed in the direct rays of the sun for a total of about 24 hours. The other two dishes were placed in a room where the temperature was such as to cause rapid evaporation. Three days later 2 per cent potassium dichromate solution was added to the two dishes from the incubation room and the two which had been exposed to direct sunlight. No development took place in either culture exposed to sunlight, while the viability of the oöcysts dried at room temperature was reduced to 75 per cent in three days, 20 per cent in 15 days and to non-viability in 25 days.

Artificial Digestion

A fresh culture of fully sporulated oöcysts of *I. bigemina* of dog origin was washed free of preservative by centrifugation.

Four cc of a solution containing 0.3 per cent pepsin and 0.5 per cent hydrochloric acid was added to the concentrated culture. Tap water was used in the culture so that the solution would contain traces of mineral normally found in gastric juice. This solution was incubated at 37° C. for five hours, approximately the time food remains in the stomach of the dog. Microscopic examination after this time showed the oöcyst wall to be swollen and spongy in appearance. By exerting pressure upon the cover-glass, about 65 per cent of the oöcyst walls were ruptured and sporocysts were liberated but no sporozoites were freed. Examinations were made up to 15 days with no further change. Four cc of a solution containing pancreatin 0.3 per cent and sodium bicarbonate 0.25 per cent with a small amount of fresh bile was added to the above culture. This was then incubated at 37.5° C. for five hours. The examination at this time showed no further evidence of digestion. By pressure on the cover-glass about 65 per cent of the sporocysts were liberated but no sporozoites. Observations five hours and ten hours later and up to three days showed no further digestion.

This experiment was repeated several times with similar results. In other instances trypsin 0.2 per cent and sodium bicarbonate 0.25 per cent was used, pancreatin and bile were used without pepsin and hydrochloric acid, but other than a slight softening or swelling of the oöcyst wall no results were observed.

These results having been obtained with digestion *in vitro*, the following experiments were designed to learn whether they could be duplicated with the natural digestive juices of the host. In order to stimulate the secretion of gastric juice, and, in order not to have the secretion contaminated with food material, a dog was anesthetized with ether and an esophageal fistula was established surgically. The wounds were allowed to heal and then the animal was again anesthetized with ether, laparotomized and a gastric fistula established. A small test-tube for collecting gastric juice was placed in the fistulous gastric opening and held in place by sutures. Gastric juice was collected free from contamination by stimulating the gastric secretion through feeding. The gastric juice was filtered so as to remove coarse débris.

Two cc of a freshly sporulated culture was diluted with 2 cc of filtered gastric juice and incubated for 5 hours at 37.5° C. Microscopic examination at this time was similar to that noted in the experiments *in vitro*. Examinations were made up to three days with no further change.

In order to observe the action of duodenal secretion a dog was anesthetized with ether and laparotomized. The duodenum was isolated and severed near its termination. The posterior cut por-

tion was tied off with catgut. The anterior cut portion was brought to the outside and sutured to the skin, making a duodenal fistula. A test-tube was placed in the fistula and held in place by sutures. The material collected in the test-tube was filtered to remove any débris present.

Two cc of a freshly sporulated culture were placed in 1 cc of the solution collected at the duodenal fistula and incubated at 37.5° C. Microscopic examination after three hours showed the changes similar to experiments *in vitro* with a possible exception of slightly greater digestion.

Pathogenesis Following Artificial Infection of Dogs

Dog 10, approximately twelve weeks old, was given 15 cc of culture A *(I. bigemina)*. The elimination of oöcysts began on the fifth day and reached the peak of elimination on the seventh day and continued until the 28th day. Catarrhal diarrhea began on the third day and the feces were tinged with blood on the fourth to seventh day.

Dog 11, approximately three months old, was given 20 cc of subculture A *(I. bigemina)*, a very rich culture containing approximately 5,000 oöcysts per cc. The animal developed a profuse hemorrhagic diarrhea on the fourth day; oöcysts were found in the feces in large number on the seventh day. The animal died on the ninth day after inoculation.

Dog 10 was given 25 cc of a freshly sporulated culture D, approximately *I. rivolta*, 40 per cent; *I. felis*, 30 per cent, and *I. bigemina*, 20 per cent. From the fourth to the tenth day, the feces were marked with blood. On the sixth day, all oöcysts examined were *I. rivolta*. *I. felis* oöcysts appeared on the seventh day and *I. bigemina* oöcysts on the ninth day. This animal continued to eliminate oöcysts 30 days after inoculation.

Dog 12 was given 15 cc of lean culture G *(I. bigemina)*. No symptoms of any significance developed. Oöcysts were found in the feces on the seventh day and continued until the 15th day.

Dog 13 received 15 cc of sporulated culture C *(I. bigemina)*. No oöcysts appeared in the feces for 21 days. Twenty cc of sporulated culture D was given on the 22nd day. Six days after inoculation with culture D, oöcysts of *I. bigemina* appeared in the feces in large numbers, the height of elimination being on the eighth day. Elimination of *I. bigemina* continued until the 25th day. No oöcysts of *I. rivolta* or *I. felis* were passed. This animal was acquired four days before the first inoculation and was about six months old. No history was obtainable and possibly a previous infection with *I. rivolta* and *I. felis* had occurred.

Dog 14 was given 20 cc of a lean culture in which at least 90 per cent of the coccidia were *I. bigemina;* a few *I. felis* and *I. rivolta* were present but their number did not exceed 10 per cent of the total. This culture was previously incubated at a temperature of 29 to 30° C., and aerated daily for 14 days. The culture then was allowed to remain in a room with a temperature of about 15° C. for four days with no aeration. On the tenth day after receiving the infection, *I: bigemina* oöcysts were passed in small numbers until the 14th day, at which time they increased greatly. *I. rivolta* and *I. felis* oöcysts were first eliminated on the 13th day and were found in small numbers in the feces until the 18th day. *I. bigemina* oöcysts were eliminated until the 32nd day.

Dog 15 was given 20 cc of sporulated culture A *(I. bigemina).* Oöcysts were found in the feces first on the sixth day. The animal was killed for autopsy on the seventh day.

Dog 16 was given 25 cc of a freshly sporulated culture D *(I. bigemina, I. rivolta, I. felis).* A profuse bloody diarrhea containing a great amount of gas occurred on the fourth day. Elimination of oöcysts began on the seventh day, at which time the animal was killed for autopsy.

Symptoms

The symptoms of coccidiosis in the dog vary in severity depending upon the number of coccidia ingested and the natural resistance of the individual. It may be stated safely that catarrhal hemorrhagic enteritis with diarrhea occurs and general anemia, rapid emaciation, depression and weakness are predominant symptoms. The symptoms usually occur on the fifth to sixth day after infection. The first symptoms noted are a catarrhal diarrhea, becoming profuse, gaseous and bloody in about two days. During this period, blood-tinged feces are passed, the animal is very depressed and weak, and the appetite is lost or greatly impaired. The temperature is slightly elevated. The animal withdraws to the far end of the cage and cries when handled. Emaciation is very rapid, being accompanied by extensive weakness and increased thirst. The conjunctiva becomes almost white and the gums are pale and dry. Muscular tremors of the posterior limbs often are observed, as are epileptiform seizures. If the animal is to recover, blood-tinged diarrhea gives way to gelatinous mucous discharges on about the seventh to the ninth day and active symptoms usually disappear by the 15th day. In light infections the only symptoms noted are a mild catarrhal diarrhea, in which the passage is slightly tinged with blood. The appetite

is normal and the animal becomes slightly emaciated and depressed.

PATHOGENESIS

The pathologic changes in coccidiosis of the dog are primarily confined to the small intestine. The most noticeable gross lesions are acute hemorrhagic ulcerative enteritis with apparent loss of surface epithelium and mucosal thickening. The lesions are most severe in the ileum, especially the lower portion, less so in the jejunum and least in the duodenum. The hemorrhages vary from petechial, in mild infections, to diffuse, in severe acute infections. The petechiae occur in the mucosa and are especially numerous in the Peyer's patches, giving them a uniformly dark red appearance. The inflammation varies from a catarrhal enteritis, in slight infections, to a severe hemorrhagic enteritis, in severe infections. The mucous membrane is visibly thickened and the ridges are swollen and hemorrhagic. Gross lesions other than intestinal are fatty degeneration and focal necrosis of the liver and cloudy swelling of the kidneys. The spleen is enlarged and shows an increase in connective tissue.

As far as has been observed, *I. rivolta* and *I. felis* invade only the surface epithelium of the tips of the villi (fig. 5). The parasite appears to enter a single epithelial cell where it locates below the nucleus. During the growth of the parasite, the nucleus of the cell is pushed upward until it appears as a crescentic form near the upper border of the cell membrane. The cell becomes larger due to the growing parasite. In many cases, however, it is difficult to determine the location of the nucleus of the cell as the cell appears to be somewhat rotated.

In slight infections there is merely a desquamation of the surface epithelium of the tips of the villi (fig. 6).

In experimental infection and when large numbers of the infective agent have been given, the desquamation is more extensive and extends well down toward the bases of the villi. The epithelium may be completely peeled from the villi and is found in sheets loose in the lumen of the intestine. The area surrounding the tissue destruction is infiltrated with hemorrhage which possibly is due to the destruction of capillaries. There appears an infiltration of leucocytes, the predominating type being eosinophiles and polymorphonuclears. The surface of the intestinal mucosa shows injury with loss of epithelium comparable in extent to the degree of hemorrhage. The epithelium of the villus is frequently formed into folds due to the accumulation of exudate and parasites.

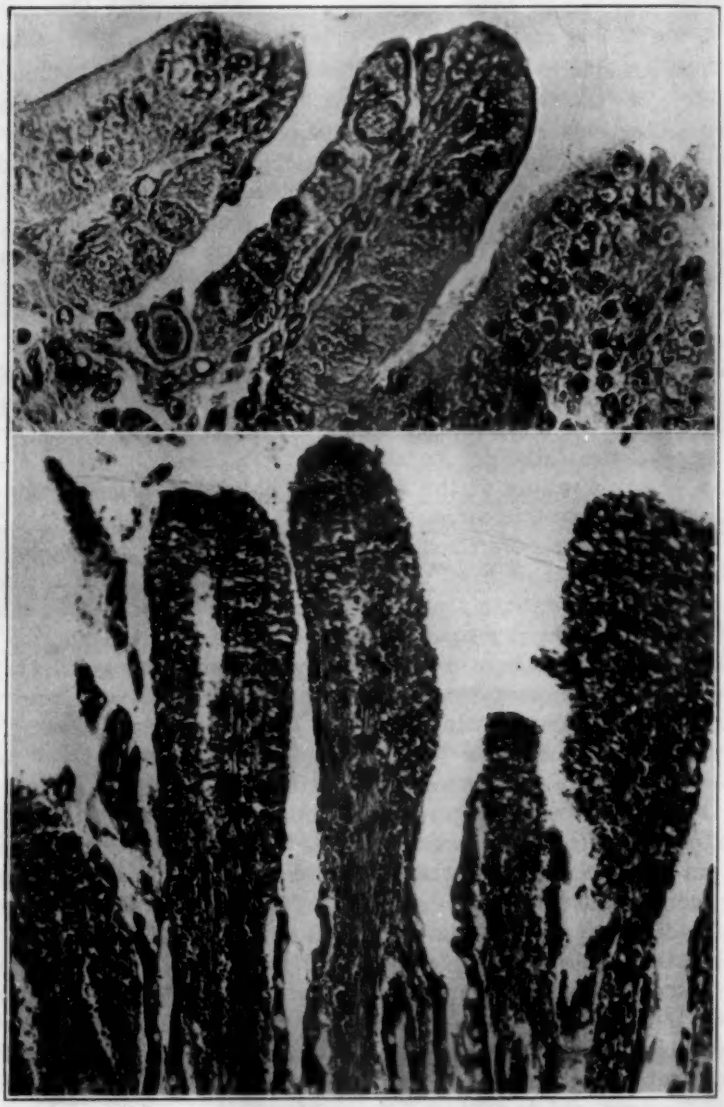

FIG. 6 (below). Desquamation of epithelium of villi due to of ileum (x 550).

FIG. 5 (above). *Isospora rivolta and Isospora felis* in epithelium coccidiosis (x 385).

In experiment animals which have been given continuous feedings of the infective agent in an attempt to produce immunity, it was found that an excess of connective tissue had formed in the tips of the villi. Many of the epithelial cells show a crescent-shaped nucleus which appears to be dead. Although no parasites were found it is assumed that injury to the cell was caused by the parasitic invasion.

I. bigemina may be confined to the surface epithelium but in most instances is found in the deeper tissue of the villi and may be found surrounding the glands. The developmental forms are so small it is impossible to follow through their development. The invaded villi are enlarged, due to infiltration of eosinophiles and polymorphonuclear leucocytes, hemorrhage and parasites. The villi break down and allow the parasites to escape into the lumen of the intestine. In experiment animals that have been infected with *I. bigemina* there appears to be an increase in connective tissue of the substance of the villi *(tunica propria)*.

In animals that have been destroyed after having recovered from an infection with coccidiosis, an excessive amount of connective tissue is noted in the *tunica propria*. Blood-counts and differential counts of infected animals are shown in table IV.

IMMUNITY

The same strains of coccidia were used in the studies on immunity as were mentioned previously. The large amount of

TABLE IV—*Average blood counts and differential counts of nine dogs artificially infected.*

DAY	ERYTHROCYTES	LEUCOCYTES	POLYMORPHONUCLEARS (%)	LYMPHOCYTES (%)	EOSINOPHILES (%)	MONONUCLEARS (%)
1	6,300,000	9,000	68.0	19.4	6.3	6.3
2	6,280,000	91,000	65.0	21.7	6.7	6.6
3	5,300,000	12,000	75.0	20.0	3.0	2.0
4	5,000,000	20,000	90.0	5.0	2.0	3.0
5	5,100,000	25,000	70.0	10.0	20.0	0.0
6	3,400,000	36,000	60.0	15.0	25.0	0.0
7	3,500,000	34,000	40.0	20.0	35.0	5.0
8	3,900,000	35,000	42.0	30.0	25.0	3.0
9	4,900,000	20,000	40.0	25.0	30.0	5.0
10	5,300,000	15,000	50.0	20.0	25.0	5.0
11	5,700,000	13,000	50.0	25.0	20.0	5.0
12	5,900,000	12,000	60.0	20.0	15.0	5.0
13	6,000,000	10,000	65.0	15.0	15.0	5.0
14	6,000,000	11,000	68.0	19.0	7.0	6.0
15	6,200,000	12,000	65.7	21.2	5.3	6.8
16	6,100,000	13,000	65.0	22.4	8.2	4.4
17	6,300,000	8,000	51.7	33.5	13.6	1.2

culture necessary for these experiments was obtained by the feeding of susceptible dogs. Composite samples were collected and mixed with 2 per cent potassium dichromate solution.

The severity of the infection was determined by the numbers of oöcysts in composite samples of feces of daily elimination. Numerical counts made are merely a representation of the degree of infection and are not numerically specific. The counts were made by obtaining approximately the same size flotation drop each time. Uniform cover-glasses were used and ten low-power fields were counted and averaged.

When susceptible dogs were fed sporulated forms, elimination of oöcysts began on the sixth or seventh day and were found in the feces for about 20 days.

Dog 17 was given one experimental feeding of 15 cc of a rich culture which contained about ten oöcysts per low-power field. Oöcysts were first eliminated in the feces on the sixth day and reached the peak of elimination on the seventh and eighth days. Daily fecal examinations were made showing oöcysts were eliminated until the 29th day. The animal was in a state of extreme emaciation and was allowed to rest for 60 days. A second inoculation of 15 cc of sporulated culture containing approximately the same number of oöcysts was given. Daily fecal examinations for 30 days were negative for coccidia.

Dog 18 was given 15 cc of a freshly sporulated culture containing approximately ten oöcysts per low-power field. Elimination began on the sixth day and continued until the 27th day. At no time was the elimination very great. After a rest period of 90 days, dog 18 was given 15 cc of sporulated culture A. Elimination of a few oöcysts occurred on the sixth day and continued until the 21st day. At no time was the elimination very great. This animal possibly had some resistance to infection.

Dog 19 was given 15 cc of sporulated culture A *(I. bigemina)* containing approximately ten oöcysts per low-power field. Elimination began on the sixth day in enormous numbers followed by an increase in numbers on the seventh and eighth days. Oöcysts were eliminated for 22 days. After a period of 60 days this same animal was given 15 cc of sporulated culture A. Oöcysts in small numbers were found in the feces on the seventh day and were found daily for 15 days.

Another rest period of 60 days was given and a similar amount of the same culture was given. Oöcysts were first found in the feces on the sixth day and continued for twelve days. The number of oöcysts eliminated was very small. This animal was given a rest period of 180 days and then given 15 cc of sporulated culture

A *(I. bigemina)*. Oöcysts were observed in large numbers on the seventh day comparable to the numbers on the first infection and were found daily for 21 days.

Dog 20 was given daily 10 cc feedings of fully sporulated culture A *(I. bigemina)*. Elimination of oöcysts was noticed first on the sixth day and reaching the height of elimination on the eighth day. Oöcysts were found in the feces for 38 days. Daily feedings were continued for 20 days or until the 64th day. There was a complete immunity as shown by failure to eliminate oöcysts, although daily feedings were given. After a period of 60 days, dog 20 was given 15 cc of sporulated culture A. Daily fecal examinations for 20 days were negative for coccidia. After a period of 90 days, dog 20 was again given 15 cc of sporulated culture. Fecal examinations daily were negative for 20 days. After a rest period of 90 days after the last inoculation or 274 days after the first inoculation, 15 cc of culture A was given. Fecal examinations for 20 days were negative. This experiment was repeated twice with fully similar results.

Dog 21 was given 10 cc daily feedings of sporulated culture A *(I. bigemina)* until oöcysts were first eliminated, which was on the sixth day. Oöcysts were found daily for 30 days. After a rest period of 60 days, this same animal was given 15 cc of sporulated culture A. Oöcysts were eliminated as determined by daily fecal examinations for 21 days. A 90-day rest period was given and this dog was fed 15 cc sporulated culture A *(I. bigemina)*. Oöcysts in small numbers were eliminated on the sixth day and for eleven days thereafter.

Dog 24 was given 15 cc of sporulated culture D, a culture of dog origin. This culture contained *I. rivolta* about 40 per cent, *I. felis*, 50 per cent and *I. bigemina* 10 per cent. On the sixth day after inoculation, *I. felis* oöcysts occurred in the feces. *I. rivolta* and *I. bigemina* oöcysts did not appear until the ninth day. Elimination continued for about 21 days for all forms. After a rest period of 90 days, this animal again was fed 15 cc of sporulated culture D. Elimination of *I. felis* and *I. rivolta* occurred on the sixth day and continued for 21 days, but the feces remained negative for *I. bigemina* during the next 21 days. After a period of 120 days, this animal again was fed 15 cc of sporulated culture D. Small numbers of *I. bigemina* were eliminated on the eighth and ninth days, respectively, the elimination continuing for 20 days. It appears that there is more resistance developed by the forms which penetrate into the deeper tissues. This experiment was repeated twice with similar results.

Discussion

This study has been concerned primarily with the pathologic changes produced in the dog by the invasion of coccidia. However, in the study of any infectious disease it is of prime importance to learn as much as possible about the morphologic and physiologic characteristics of the infective agent. It is equally necessary to be able to recognize and separate the different species. For these reasons considerable time has been spent in an attempt to gain information of a fundamental nature concerning the infective agents of coccidiosis in dogs.

It is important to know whether dogs will contract the infection from rabbits suffering from coccidiosis. It is to be noted that dogs could not be infected with cultures of Eimeria of rabbits; neither could they be infected by species of Eimeria from chickens. Cross-infection by species of Isospora of feline origin was possible for dogs. Isospora of dog origin also were found infective for cats. It is also to be noted that Isospora of dogs were infective for foxes, the course of the infection being similar to that produced in dogs. Isospora of foxes also were infective for dogs. However, only a small form was eliminated in the feces. This form we believe is *I. bigemina*.

It seems quite evident that the oöcysts of the three species of Isospora of dogs studied are not so resistant to extremes of temperature, disinfectants and putrefaction as is generally believed. The thermal death point of 52° C. is very low compared with most other resting forms of microscopic life. The minimum temperature to which the spores may be subjected is not as great a factor in the infection of dogs as in coccidial infections of other animals. This is due to the roving habit of dogs. The action of various disinfectants, especially that of mercuric chlorid, mercuric iodid, sunlight and steam is so effective in destroying nonsporulated oöcysts that they can be used to advantage in most instances.

It is not surprising that it was found impossible to digest Isospora oöcysts of the dog *in vitro* or by the action of the normal host digestive juices. It is probable that mechanical factors in the digestive tract play an important rôle in the liberation of sporocysts and sporozoites.

A study of the results of artificial infection with coccidia of the dog shows that oöcysts first appear in the feces at five or six days. This phase of the disease is preceded and accompanied by symptoms of a catarrhal or bloody diarrhea, depending upon the severity of the infection. Symptoms are present two or three days before oöcysts are eliminated.

The disease in dogs has in general a chain of symptoms of which profuse hemorrhagic diarrhea with progressive emaciation and weakness is predominant. The severity of symptoms depends upon the severity of the infection, light infections showing no clinical manifestations, although the infective agent may be present.

The pathologic changes are primarily intestinal, although other changes occur in the parenchymatous organs similar to those produced by other infectious agents. Changes occurring in the blood include eosinophilia. Immature eosinophiles are also observed in large numbers around the parasitized cells. Age incidence is not so great a factor as is stated in the literature, but in some instances older dogs show more resistance.

Resistance to the infection seems to occur but is not lasting. In cases where the surface epithelium only is involved, the factor of self-limitation plays an important rôle. This does not occur to the same degree where the deeper structures of the intestine are involved. Complete immunity seems to be developed by daily infections over a period of at least three months.

Conclusions

1. There are many contradictory statements in the literature concerning coccidiosis of dogs. Much of the laboratory work has been conducted with animals of unknown history or with animals suffering from some other disease. In many cases animals died before conclusive evidence could be reached.

2. *Isospora bigemina, Isospora rivolta* and *Isospora felis* from cats and dogs appear to be infective for both animals, although the severity of infection may vary in each. *Isospora bigemina* of dogs, cats and foxes appears to be infective to all three animals. With these exceptions they appear to be host specific.

3. The minimum thermal death point of nonsporulated oöcysts of *Isospora bigemina, Isospora rivolta* and *Isospora felis* is about 52° C. with an exposure of ten minutes.

4. Winter temperatures of Iowa destroyed sporulated and nonsporulated oöcysts of the three species of Isospora of dogs.

5. A temperature of 8° C. for two days reduced the number of nonsporulated oöcysts that developed at 27° to 30° C.

6. Drying in the direct rays of the sun for 24 hours killed Isospora oöcysts of dog origin. Drying out of the sun was less effective.

7. It appears that putrefaction readily destroys nonsporulated oöcysts of dog origin in a short time.

8. Fully sporulated coccidia of dog origin were rather difficult to digest by artificial means. Using the normal digestive juices of the host made them less difficult.

9. When fully sporulated oöcysts are given to a susceptible animal, symptoms of diarrhea occur on the fourth day. Oöcysts are eliminated first on the sixth or seventh day and are eliminated for 15 to 22 days.

10. The predominant symptoms of coccidiosis as it occurs in dogs are a bloody diarrhea, rapid progressive emaciation, and extreme anemia and weakness.

11. Symptoms and lesions vary with the severity of the infection.

12. Pathologic changes occurring in coccidiosis of the dog are confined to the small intestine. The predominating lesions are a loss of surface epithelium with leucocytosis and hemorrhage. The parasite is located below the nucleus in the parasitized epithelial cell.

13. One infection produces varying degrees of partial resistance to later infection but does not result in an absolute immunity.

14. The feeding of infective forms following recovery from previous infections caused by single feedings results in increased resistance to subsequent infections provided intervals between infections are of short duration.

15. A complete immunity is produced by daily small artificial infections. This immunity appeared to be permanent.

16. Forms penetrating deeper tissues *(Isospora bigemina)* show more resistance than those of superficial location.

17. Coccidiosis in dogs appears to be in most cases a self-limiting infection.

18. *Eimeria canis*, described by Wenyon, in England, in 1923, and reported by Skidmore and McGrath, in Nebraska, in 1933, has not been observed in connection with this study.

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Cattle Tick Quarantined Area Reduced

Additional progress in eradicating cattle ticks from sections in the South still infected with this disease-carrying pest is shown in an order signed by Hon. M. L. Wilson, Acting Secretary of Agriculture, effective December 1, 1934. The order releases from federal quarantine 12,756 square miles of territory in Florida and Louisiana. This progress is the result of the systematic dipping campaign conducted by state and federal authorities in these sections during the active tick-eradication season this year. The new federal order, which is known as B. A. I. Order 349, affects the following areas:

Florida: The remaining areas of Glades, Highlands and Lee counties are released from quarantine.

Louisiana: Acadia, Bienville, Bossier, Cameron, Jefferson Davis, Lafayette, Saint Helena, Saint Tammany, Tangipahoa, Vermilion, Washington and Webster parishes; the remaining areas of Iberia, Livingston and Saint Martin; and parts of Calcasieu and Saint Landry parishes are released from quarantine.

The existing quarantine in the state of Texas and the territory of Puerto Rico is continued. The area now under federal quarantine is confined to eleven counties in west-central Florida, 24 parishes west of the Mississippi River in Louisiana, and 36 counties in the southern and eastern parts of Texas.

There is great ability in knowing how to conceal one's ability.—ROCHEFOUCAULD.

A STUDY OF PRESERVATIVES FOR RAPID-TEST BRUCELLA ABORTUS ANTIGEN*

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Antigen preparations for the rapid or plate method of agglutination testing for Brucella infections are being dispensed to veterinarians and physicians for use as a field diagnostic method. Such antigen preparations necessarily are held for varying lengths of time before use. It is not practical for the diagnostician to obtain a fresh supply of test fluid each time he has occasion to use it. Obviously, it is important that he should have antigen available that has a suitable sensitivity if reliable results are to be obtained.

The commercial laboratories dispensing such test fluids have recognized the possibility of change in the sensitivity of their products after they leave their hands and have printed an expiration date on the label of each bottle. The periods when the antigen is thereby said to be suitable for use have been estimated without any adequate experiments that have been published. The period before the expiration date is apparently not uniform for the products being supplied by different laboratories. It appears to vary from about six months to approximately two years.

A series of experiments have been conducted in this laboratory to determine the keeping qualities of rapid-test *Brucella abortus* antigen preparations. Varying concentrations of different preservatives were used. The concentrations of each preservative employed in this experiment were selected after preliminary tests to determine the maximum amounts that could be employed without visibly altering the serum or without appreciably inhibiting the agglutination reaction when used within one month from the date of the preparation of the antigen.

Each preparation of antigen was divided into two equal parts. One was stored in the refrigerator at about 40° C. when it was not in use. The other part was kept in a dark cabinet at room temperature. Each antigen preparation was made in sufficient quantity to permit tests of ten serums once each month for one year. The antigens were prepared and the rapid tests conducted in accordance with our previous recommendations[1] except for the

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preservative added. Freshly prepared rapid and test-tube antigens were used in tests of all serums each month as a check on their agglutination titres. The tube tests were conducted in accordance with the recommendations of the United States Live Stock Sanitary Association.[2] The serums were selected to represent a wide range of agglutinin content. Tests of a single serum at a time were conducted with all antigens in the series. This permitted the technician to observe more accurately the difference in sensitivity of the various preparations and tended to minimize the errors of observation of tests. It is desirable to minimize such errors (as occur in testing unknown duplicates) when attempting to measure the effect of a single variable such as was desired in this experiment. This system has the disadvantage of permitting human bias, but since the errors of observation in testing duplicates are known[3] to be pronounced, it was considered desirable to minimize them for this experiment.

The results will be reported separately for each preservative used in the experiment.

Phenol

Three concentrations of phenol were employed, namely, 0.5 per cent, 1 per cent, and 1.5 per cent. Preparations with each concentration of phenol were made in duplicate, one with and one without the addition of dyes (gentian violet and brilliant green) in accordance with Huddleson's[4] recommendations. Further duplicates of each of the above preparations were used, one stored at room temperature and the other in the refrigerator (about 40° C.). Thus there were twelve preparations of the antigen in the series.

Results: No differences in sensitivity were apparent for three months. On the fourth monthly test, the preparations containing 1.5 per cent phenol and those held at room temperature, regardless of phenol concentration, showed slight reduction in sensitivity. After six months, the preparations stored at room temperature were definitely less sensitive than those stored in the refrigerator. Also the antigens containing the greater concentrations of phenol (1 per cent and 1.5 per cent) were less sensitive and those containing dyes were less sensitive. The most sensitive preparation was that containing 0.5 per cent phenol without any dye and stored in the refrigerator. The sensitivity of this preparation did not change appreciably until after nine months, when it too gave somewhat lower agglutination titres than those obtained with fresh preparations of the antigen.

Comment: The reduction in sensitivity of the most stable preparation in this group (0.5 per cent phenol, no dye, stored in refrigerator) was not marked but was sufficient to lower the titres of serums from one dilution to the next lower one on the average. Somewhat more marked reductions in sensitivity were observed in the other preparations. These data demonstrate that it is not possible to improve the keeping qualities of such test fluids by increasing their phenol content above that usually employed, *i. e.*, 0.5 per cent. They also emphasize the importance of refrigeration for maintaining the sensitivity of such material. If the experiment were repeated, we would expect some variation from the original results. However, these data suggest that it usually would not be safe to use rapid-test antigen preparations longer than six months after the date of production under average good conditions in the field.

FORMALIN

Three concentrations (0.1 per cent, 0.25 per cent, and 0.5 per cent) of formalin (40 per cent formaldehyde gas in water) were used. As in the preceding series of antigen preparations, each concentration of formalin was used with and without the addition of dyes. Also, each antigen in the series was prepared in duplicate, one being stored at room temperature and one in the refrigerator. Thus there were twelve preparations of the antigen in this series.

Results: No changes in sensitivity were observed until the third monthly test. At this time the preparation containing 0.1 per cent formalin and dye and kept at room temperature was covered with a mold and was discarded. The preparations that had been stored at room temperature were slightly less sensitive than those kept in the refrigerator. This difference was chiefly in the character of agglutination observed rather than differences in titres.

After four months, the preparation containing 0.1 per cent formalin without dye and stored at room temperature was covered with a mold and was discarded. No other changes were noted.

At the time of the fifth monthly test, the preparation containing 0.25 per cent formalin, with dyes, and kept at room temperature, was excluded from the experiment because of the presence of a mold. Those preparations stored in the refrigerator continued to show a trifle more sensitivity than those kept at room temperature.

After the sixth month, the remaining preparations that had been kept at room temperature and the one containing 0.1 per

cent formalin, without dyes, and stored in the refrigerator, were discarded because of growth of molds on them. No further difference in the sensitivity of the balance of the preparations was noted.

On the eighth monthly test, the preparations containing dyes were less sensitive than comparable products not containing dyes.

After twelve months, the preparation containing 0.25 per cent formalin without dye and stored in the refrigerator was the most sensitive one of the group, but it gave markedly lower agglutination titres than were obtained with freshly prepared rapid or test-tube antigen preparations.

Comment: These data show that formalin is not a suitable preservative for rapid-test *Brucella abortus* antigens. It must be remembered that the active principle in formalin is a volatile gas. It appears that after a short time the concentration of formalin is reduced by evaporation even in tightly stoppered bottles that are opened occasionally and the products are thereby not adequately preserved. As was observed[5] in similar studies of test-tube preparations of the antigen, it appears that concentrations of formalin of about 0.25 per cent to 0.5 per cent are inhibitory to the sensitivity of the antigen.

Tricresol (U. S. P.)

Two concentrations (0.2 per cent and 0.5 per cent) of tricresol were used. As before, duplicate preparations were made, one kept at room temperature and one in the refrigerator. Thus there were eight preparations of the antigen in this series.

Results: No differences in sensitivity were observed until the third month. At this time those preparations containing 0.5 per cent tricresol gave somewhat lower agglutination titres and the reactions were slower than those obtained with other preparations in the series or the check tests.

Tests after four, five and six months showed a gradual reduction in sensitivity of the preparations containing 0.2 per cent tricresol until there was very little difference between those containing 0.2 per cent or 0.5 per cent. Also the preparations containing dyes gradually decreased in sensitivity and those stored at room temperature gave definitely lower titres than those stored in the refrigerator.

After eight months, all of the preparations in this series gave lower agglutination titres than were obtained in tests with freshly prepared antigen. The reduction in titres was about 50 per cent or more on the average.

Comment: These data show that tricresol is not a suitable preservative for rapid-test *Brucella abortus* antigen. In addition to its unsatisfactory preservative qualities for such material, it has the disadvantage of its pungent odor which, to some people, becomes quite obnoxious in conducting a long series of tests. The odor from an antigen containing tricresol is liberated quite rapidly, due to evaporation of the test materials on the glass plate.

TRYPAN BLAU

The experiments with trypan blau were designed in a little different manner from the preceding ones. This material (Dr. G. Grübler and Co.) was studied as a preservative by itself and as a dye preservative in combination with phenol.

Six concentrations of trypan blau were used, *i. e.* 1:1,000, 1:2,500, 1:5,000, 1:10,000, 1:25,000 and 1:50,000. Each concentration of trypan blau was used with and without 0.5 per cent phenol, making twelve different antigen preparations. Each of these was prepared in duplicate, one being stored in the refrigerator and one at room temperature. Thus there were 24 preparations of the antigen in this series.

Results: On the first test, within one week, the preparation containing 1:1,000 trypan blau without phenol and kept at room temperature was discarded because of putrefaction. The other preparations containing 1:1,000 trypan blau contained too much color for satisfactory observation of agglutination. The remaining preparations appeared to be uniform in sensitivity.

After one month, all of the preparations not containing phenol were discarded because of the growth of mold on them. After three months, the remaining preparations stored at room temperature were somewhat less sensitive than duplicates held in the refrigerator. After six months, none of the preparations were as sensitive as the freshly prepared rapid or test-tube preparations of the antigen.

Comment: These results show that trypan blau is not a suitable preservative for rapid-test *Brucella abortus* antigen preparations.

CONCLUSIONS

1. Of the preservatives used in this study, phenol in 0.5 per cent concentration is the most suitable for rapid-test preparations of *Brucella abortus* antigen.

2. Refrigerator temperatures rather than room temperatures are important for preserving the sensitivity of such antigen preparations regardless of the type or concentration of preservative used.

3. The addition of dyes (gentian violet and brilliant green) to rapid-test antigen preparations tends to reduce their sensitivity, after several months as compared to similar preparations without dye.

4. Under good average conditions, no antigen preparation preserved in any of the ways employed in this experiment can be depended on to retain its sensitivity longer than about six months.

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A Canine Hero

Belle, a two-year-old police dog belonging to Earl Day, of Athens, Ga., is a heroine, although she wears no Carnegie medal. Her act of bravery consisted of attacking a rabies-infected dog that entered the yard of her owner and made straight for six children that were playing there. She held her grip on the mad dog until help came, but not until she herself had been bitten severely. One of the youngsters who had ventured too near also was nipped by the diseased dog. When the mad dog had been killed, medical treatment was given the youngster, but there was no money to provide treatments for Belle. Finally, through a campaign for aid started by the Athens *Banner-Herald* and through the coöperation of Dr. T. E. Jago (Ont. '92), who gave Belle the needed treatments without charge, the brave dog fully recovered. She is still watching over her little playmates, according to the house organ of an insurance company, which published the story.

Horse Is 43 Years Old

"Roger," a horse owned by Alfred Wayland Cutting, of Wayland, Mass., is 43 years old. *Our Dumb Animals* says that "Roger" still carries Mr. Cutting on his two-mile daily trip to the village post office.

INTERNAL HYDROCEPHALUS IN A DOG*

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Internal hydrocephalus may be defined as a disease characterized by an increased quantity of cerebrospinal fluid in the ventricles of the brain, causing dilatation of these cavities, enlargement of the brain, and increased intracranial pressure.

McKinley,[1] in Bell's "Text-Book of Pathology," stated that internal hydrocephalus is not infrequent in children, and that it may be congenital or acquired. In the congenital type, the head often is enormously enlarged; the ventricles may be so dilated that the walls of the brain are little more than thin membranes. The author stated that cerebral injury in these cases is severe, and that various grades of feeblemindedness and of paralysis may develop, depending on the severity of the disease. Children with mild grades of hydrocephalus may not reveal any evidence of mental or physical impairment.

According to McKinley, hydrocephalus in the adult cannot cause enlargement of the head because the sutures and fontanels are closed and firmly bound together, hence a marked increase in fluid may cause grave symptoms of brain injury, such as headache, nausea, vomiting, dizziness, choked disks and blindness, Cheyne-Stokes respiration, and various mental states.

The causes of internal hydrocephalus in man are many. Any obstruction in the foramina or in the aqueduct will cause distention anterior to the point of occlusion. McKinley[1] stated:

> The common cause of obstruction are tumors, inflammatory adhesions and congenital atresia. Inflammation of the meninges in the roof of the fourth ventricle may close the foramina. A common cause of acquired hydrocephalus is meningitis, which brings about thickening of the piaārachnoid and prevents the absorption of the cerebrospinal fluid into the veins. In some instances in infants no explanation for the hydrocephalus can be found.

Hutyra and Marek[2] stated that internal hydrocephalus in animals is seen most frequently in the horse and is a common cause

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of "sleepy staggers" in this animal, but no exact data as to its frequency are available. They mentioned that Fröhner observed 20 cases of internal hydrocephalus in 70,000 dogs. Roquet observed it in a 4-year-old dog.

The most common symptoms of internal hydrocephalus in animals are marked changes in expression and behavior. The animals have a dull, meaningless expression and, if not disturbed, may remain in one place and position for hours. An affected horse usually will walk about quite normally on level ground, but may experience difficulty in stopping suddenly, turning sharply, or stepping over some object placed in his path. When eating, he may forget to masticate or to swallow food and may permit it to drop from his mouth. He may appear to fall asleep. Müller and Glass[3] mentioned that Fröhner observed the following symptoms in dogs: dullness, head inclined to one side, uncertain gait, amaurosis, deafness, and loss of sense of smell.

As in man the causes of internal hydrocephalus in animals are numerous. Secondary hydrocephalus is most common and occurs after cerebral disease, such as acute meningo-encephalitis, frequent or protracted cerebral hyperemia, acute encephalitis, cerebral tumors, and so forth. Uncommon causes are occlusion of the foramen of Munro or of the aqueduct of Sylvius by parasites, cysts of Echinococcus or Coenurus. Dexler's investigations tended to show that the frequent occurrence of hydrocephalus in horses is due to anatomic conditions of the skull cavity.

Case Reports

Case 1: On August 22, 1933, a male fox terrier, approximately 18 months of age, was brought to me because of repeated attacks of convulsions and unconsciousness. These attacks were first observed late in July and had gradually increased in frequency. There was nothing unusual in the character of the convulsions. The dog would salivate excessively and fall to the ground unconscious. After varying lengths of time, from perhaps a minute to several minutes, he would rise to his feet, look about, and then run as if frightened. Within a half-hour he would again appear to be quite normal. His diet was varied and had been changed without apparent benefit.

There was no definite history of this dog having had distemper or any other infectious disease. However, since he was procured from a kennel in which distemper was quite prevalent, it is entirely possible that he had had this disease. When only a puppy, this dog had been in an automobile accident and had

received a severe head injury. Some visual disturbance had been noted at this time, but it had disappeared within a few days.

External examination revealed no definite lesions. The dog was in good condition and free from parasites. He did, however, have a dull or distant expression in his eyes, as if he were not seeing things close by. He responded very slowly when spoken to and, at times, appeared frightened. This, in itself, however, was not significant, as some dogs behave in that manner when in a strange place. His appetite, temperature, pulse and respiration rate, and bowels were normal. In the absence of definite lesions, and because of the history of previous head injury with visual disturbance, epilepsy of the Brown-Séquard or jacksonian type was suspected.

The dog was hospitalized until October 10. Throughout the period of observation he was not seen to have convulsions. However, a gradual change in his behavior and disposition was evident. He appeared to forget things from one day to the next. He never displayed the slightest emotion when approached or spoken to by any one. When taken from his cage and placed on the floor he would remain there. He did not appear to be blind, for he did not run into objects when at liberty, and he always appeared to see his food when placed before him. When taken home he did not recognize his owner or any other member of the family and was still unemotional when spoken to or petted. He forgot his previous training and soiled the floor in the house without any apparent concern. His pupils were partially dilated and he would stare as if he saw nothing. He failed to heed commands and appeared stupid. Because of these conditions the owner asked that the dog be destroyed. This was done with ether.

At necropsy, the thoracic and abdominal viscera revealed no lesions. The cranium was opened and the brain exposed. The brain seemed quite large, but gross evidence of meningitis or of other injury was not apparent. However, when the brain was removed, sectioned, and compared with the brain of another dog of the same size and breed, rather marked dilatation of the lateral ventricles and enlargement of the brain were observed (fig. 1). The cause of the dilatation was not grossly evident.

Case 2: A male, wirehaired fox terrier, approximately six years of age, was brought to me, January 31, 1934. He appeared weak or dizzy; on arising to his feet he would spread his legs as if trying to brace himself and, when he attempted to walk, he would weave or stagger. Frequently he would walk in a circle

for a minute or longer, generally to the right. He displayed little if any emotion when spoken to or petted, and did not respond normally to commands. However, he was easily startled by loud noises. When placed on a table or on the floor, he often remained where placed until forced to move. He was not disturbed, nor did he resent being examined by me, a stranger. His sight was defective and there appeared to be some impairment in his hearing. These symptoms were first noted early in the summer of 1933, and were progressive. Convulsions had not been observed at this time. His appetite remained quite normal, and he was well nourished.

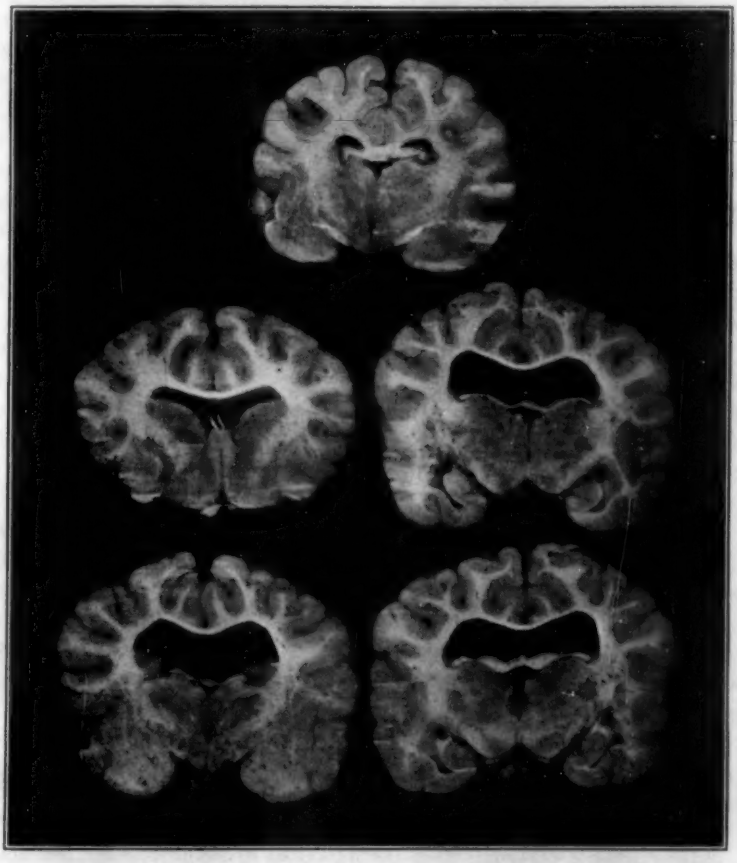

FIG. 1 (case 1). Above, cross-section of normal brain. Below, four cross sections of brain showing internal hydrocephalus. Both brains were obtained from fox terrier dogs of similar age and size.

This dog, too, had received a head injury when quite young. During the summer of 1930 he had had a severe attack of distemper followed by chorea and permanent loss of sight in his left eye. The symptoms of chorea persisted for a year or longer.

External examination revealed lesions in the eyes only. A capsular lenticular cataract was present in the left eye; the pupil of the right eye was dilated, and there was dilatation of the vessels in the fundus and beginning choked disk. His cranium was about normal in size and shape. His temperature, pulse and respiration rates were normal. Examination of his feces for parasites revealed him to be infested with tapeworms (*Dipylidium caninum*).

The history, symptoms and clinical findings of this dog suggested a lesion in the brain; internal hydrocephalus was suspected. The owner was instructed to observe the dog for convulsions or other signs of progression of the disease.

On February 6, at about 1 p.m., the dog had his first observed convulsion. He remained unconscious until late at night. After about 18 hours, he was able to arise to his feet, but with great difficulty. He did not recognize anyone or anything. He behaved as if he had received a severe blow on the head. The owner requested that the dog be destroyed with ether, and that necropsy be performed.

At necropsy, the neck, thorax and abdomen revealed no gross lesions other than an enlarged prostate gland. This was about three times average normal size. The cranium was then opened and the brain exposed. A marked increase in the pressure of the cerebrospinal fluid was noted. There was no macroscopic evidence of previous trauma.

The brain was carefully removed, fixed and sectioned. Marked dilatation of the lateral ventricles and aqueducts, with thinning of the walls of the cerebrum was observed (fig. 2). The diagnosis of internal hydrocephalus was confirmed. However, the cause of the obstruction of the aqueducts or foramina was not grossly apparent. There was some suggestion of an old healed meningitis. There also was a definite hydromyelia.

Dr. Kernohan examined both brains, both grossly and histologically, to determine the possible cause of the internal hydrocephalus. His findings in case 1 were as follows:

> There was marked flattening of the fornix and septum pellucidum causing obstruction of the foramina of Munro. Such lesions are usually the result of inflammation or tumor. However, there was no microscopic evidence of encephalitis, ependymitis, or tumor, nor was there any evidence of blood pigment to indicate a previous

trauma with hemorrhage. Therefore, at the present time one can say only that this is an idiopathic internal hydrocephalus of the lateral ventricles with flattening of the fornix and dilatation of the cavity of the septum pellucidum.

In case 2 his findings were as follows:

There was diffuse chronic encephalitis involving all portions of the brain, especially marked in the medulla and midbrain, but also in the frontal and occipital lobes. This showed perivascular collections of lymphocytes in most places, but in some areas there was a real reaction which was more characteristic of virus reactions than of the ordinary pyogenic organism. In some places there was also definite degeneration of the myelin sheaths. There was, in addition to the encephalitis, a chronic meningitis which had led to thickening of the pia and arachnoid, with partial obliteration of the subarachnoid space. In the subarachnoid space were many collections of lymphocytes. These lesions, it seems, are a satisfactory explanation of the hydrocephalus. No tumor or neoplasm of any sort was found in any part of the brain. Another

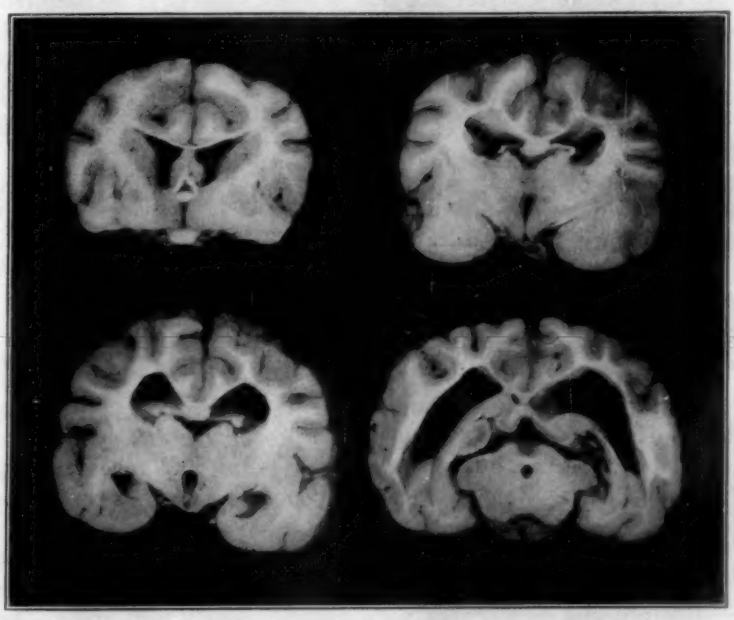

FIG. 2 (case 2). Cross-section of brain. Dilatation of ventricles and aqueducts may be acted.

interesting finding was a definite ependymitis, particularly marked in the third ventricle. This was rather localized and was not a diffuse condition.

The fact that these two cases of internal hydrocephalus in dogs were seen only a few months apart might suggest to some that the disease is common in dogs and is not recognized. I do not think this is so. The symptoms manifested by these dogs and

the clinical findings were very suggestive of the disease as seen in man. I cannot recall having observed similar symptoms in other dogs.

Both dogs had a history of having received severe head injuries when puppies, yet gross evidence of trauma could not be demonstrated at necropsy. And too, we know that head injuries are very common in man, and to date there is no scientific proof that such accidents are provocative of internal hydrocephalus.

The brain and cranium of the first dog was enlarged, indicating that the disease began before the bones of the skull were firmly united. Such enlargement was not evident in the second dog, which indicated that the disease developed later. This phenomenon has been mentioned by McKinley.

There was no macroscopic lesion in the brain of the second dog that would account for his tendency to turn to the right when walking in a circle. It is possible that this was due to the loss of sight in his left eye.

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TRAUMATIC ENTEROHEPATITIS IN A FILLY*

By P. T. ENGARD, *Marysville, Ohio*

Subject: An 18-month-old draft filly.

History: Owner stated upon my first visit that this filly had been ailing for several weeks. She did not have any symptoms of an acute character, but simply appeared dull and rather stilty in her movements. Her appetite was poor at times and ravenous at other times.

Symptoms: The following symptoms were observed on October 10, 1934. Head and limbs edematous; hair rough; flesh good; visible mucous membranes very anemic, nearly milk color. Temperature 102°; pulse, weak and irregular; breathing normal. Auscultation of lungs and abdominal cavity did not reveal any abnormalities. Eliminations from bowels and kidneys appeared normal in quantity and consistency. An examination of the feces under the microscope revealed a large number of ascaris, strongylus and tapeworm eggs.

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Accordingly, the next few days this patient was given treatment for ascarids, strongyles and bots. Also, an intravenous injection of 10 cc of sodium cacodylate was given. An arsenical tonic was left for the owner to administer twice daily.

At the end of one week, the owner reported that the patient was doing fine and that he thought she was well on the way to recovery. On October 29, the owner called and reported that overnight the filly's head had again become enlarged in appearance, her legs had stocked, she did not care to move and her appetite was gone.

Upon examination, I found her head considerably more edematous than upon my previous visit. Her temperature was 103° and I noticed that movement in the stall was undertaken with a great deal of reluctance. Breathing was nearly normal. The visible mucous membranes had a good color and feel to the finger tips. Another intravenous injection of sodium cacodylate was given. I noticed that the pulse was almost imperceptible and that the flow of blood through the hypodermic needle amounted to only a few drops.

On the second day after this (October 31), the swelling of the head had disappeared. The pulse could not be found and the heart was beating very, very fast and hard. The mucous membrane of the mouth was blanched, with a decidedly blue marking along the edge of the gums—a lead-poisoning appearance. The temperature was 105.5°. The owner was informed that the patient would die very soon, and a request for the privilege of a postmortem was made.

On the morning of November 2, the owner informed me that the patient was dead.

Postmortem: Upon opening the abdominal cavity, I found an unusually large amount of serosangineous fluid, carrying considerable shreds and clumps of exudate. Next, the omentum appeared as though a section of intestine had been strangulated. When the omentum and thick layers of coagulated exudate had been removed, the intestines were found to be a bright cherry red in stripes and blotches, filled with an unusual amount of liquid. The spleen and liver were very light in color and covered with a small amount of exudate of a yellow color. The stomach was covered with petechiae. The contents of the large intestine were semi-liquid. The large colon had become adherent to the right abdominal wall just in front of the stifle, and at the sternal flexure it had become adherent to the liver. Both adhesions contained several pockets of pus, varying in size from a small thimble to a teacup. The adhesion at the liver was six by ten

inches, and in it was a piece of baling-wire, 4¾ inches long with several crooks of very small degree, the wire being nearly straight.

This is the first time in my experience of over 20 years that I have found such a condition in a horse, although I have held postmortems on a large number.

CHICAGO VETERINARY MEDICAL ASSOCIATION

The second fall meeting of the Chicago Veterinary Medical Association was held at the Palmer House, October 9, 1934, with Dr. J. V. Lacroix, of Evanston, Ill., as the principal speaker. His subject was "Allergy in Small-Animal Practice," with particular reference to the probable causes of and appropriate treatment for those dermatoses which are usually included in the rather indefinite term "eczema." Dr. Lacroix quoted rather extensively from the work of Vaughan, and illustrated various points with references to cases that had occurred in his own practice. The subject was presented in a very practical way and brought out a thorough discussion.

At the November meeting, held on the 13th, also at the Palmer House, Dr. Glenn L. Ebright, of Hammond, Ind., showed a collection of about 50 lantern-slides, many of which were in colors, depicting various breeds of dogs. As each slide was shown on the screen, the members were asked to name the breed. Dr. Ebright then followed with a few remarks on the history and peculiarities of each one. This was a rather novel program for a veterinary meeting and was very greatly enjoyed by those present.

California Veterinary Conference

The annual veterinary conference, arranged by the University of California in coöperation with the California State Veterinary Medical Association, will be held at the University Farm, Davis, January 7-10, 1935. The program will include a symposium on diets for dogs by nutritional clinicists and practitioners, surgical demonstrations by members of the staff of the University Medical School, reports of new knowledge concerning virus diseases of swine, horses and poultry, and lectures by noted specialists in medical and veterinary science. The conference is free to any graduate veterinarian.

Look to the essence of a thing, whether it be a point of doctrine, of practice, or of interpretation.—MARCUS AURELIUS.

TEXT-BOOK OF MEAT INSPECTION. Professor Dr. Robert von Ostertag. American edition. 744 pages. Illustrated. Alexander Eger, Chicago, 1934. Cloth, $10.

As pointed out by the author, this is a new book in every respect, superseding Ostertag's "Handbook of Meat Inspection," which went through nine German editions and four English editions during a period of 30 years. Practically all of the material for this book has been rewritten and the English translation, which was made by Dr. C. F. Marshall, has been edited by Lt. Col. T. Dunlop Young, late veterinary inspector for the City of London.

The appearance of this standard work is most welcome to veterinarians, particularly in this country, in view of the fact that the English edition has been out of print for quite some time and even second-hand copies have been almost impossible to obtain. This latter fact in itself is a testimonial of the high value placed on the Handbook.

In order to keep down the size of the book and, incidentally, its cost, certain portions of the German edition have been omitted from the English edition, including the introduction, history of meat inspection, German legislation, fish inspection and a considerable number of references, nearly all of which were of German origin. A chapter on poultry, which does not appear in the original edition, has been added to the English edition.

An effort has been made to adhere in the English edition as closely as possible to the original text. Where there are differences of opinion, attention has been directed to these in the form of footnotes. For example, there are differences on evaluation in the different countries, as the employment of sterilization permits the use of some kinds of meats in one place when their use would not be permitted elsewhere.

Subjects related to meat inspection that are covered in the book include methods of slaughter by the use of mechanically operated instruments, the use of CO_2 in the transport of chilled beef from overseas, and the latest machinery used in the treatment of by-products and unsound food. Abstracts from various regu-

lations have been added in the form of appendices, as it was considered that such information might be useful to veterinary inspectors having to do with the importation as well as the exportation of meat and meat products, both in Great Britain as well as the United States.

Only by a careful reading of a book such as the one under review is it possible to secure a comprehensive idea of the ramifications of such a subject as meat inspection as it is conducted today. Veterinarians engaged in food inspection will find this book practically indispensable, and even those members of the profession who are not intimately concerned with food inspection will find a vast amount of interesting material between the covers of this book.

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The Vitamin E Content of Certain Dairy Feeds. I. L. Hathaway and H. P. Davis. (Res. Bul. 73. Neb. Agr. Exp. Sta., August, 1934. pp. 7.)

Vitamin-A Deficiency in Turkeys. W. R. Hinshaw and W. E. Lloyd. (Hilgardia, viii (1934), 9, pp. 281-304.)

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Veterinary Director General for the year ending March 31, 1934, Report of the. George Hilton. (Canada Dept. of Agr., Ottawa, Ont., 1934. pp. 59.)

Colorado Agricultural College Bulletin. Catalog Number for 1934-1935. (Fort Collins, Colo., 1934. pp. 184.)

THE NATURE AND CAUSE OF HOOKWORM ANEMIA. A. O. Foster and J. W. Landsberg. Amer. Jour. Hyg., xx (1934), 2, p. 259.

It is unnecessary to postulate a toxin to account for the anemia of hookworm disease in dogs. By confirming and extending the observations of others, the authors have found that the anemia of hookworm disease is a typical "microcytic hypochromic" type which is the type of anemia clinically associated with chronic hemorrhage. Hookworm anemia has been paralleled in every detail, including its response to iron therapy, by the simple operation of periodic, artificially-produced hemorrhage. Hookworm anemia responds well to iron therapy. Anemia associated with hookworm anemia in these experiments was not the result of hemopoietic failure, thus precluding the existence of a toxin which may act directly upon the organs of blood formation. Hookworm anemia is of a purely hemorrhagic nature.

STUDIES ON MAGNESIUM DEFICIENCIES IN ANIMALS. V. Changes in the mineral metabolism of animals following deprivation. H. D. Kruse, Marguerite M. Schmidt and E. V. McCollum. Jour. Biol. Chem., cvi (1934), 2, p. 553.

During the early stages of magnesium deficiency the course of calcium metabolism is definitely to progressively increasing retention; thereafter it is to progressively increasing elimination. Magnesium excretion is decidedly diminished throughout the entire survival period. The elimination of phosphorus is inconstant and may or may not be retained to an unusual degree but it is never excessively excreted. Of the two channels involved in the excretion of calcium, magnesium and phosphorus, the intestine predominates over the kidney in retaining these elements in the body during the first period of magnesium deficiency. Calcium retention in the early stages of the deficiency is due to the antagonism known to exist between calcium and magnesium. The breakdown in calcium retention is due to nutritive failure. Urinary data show an absence of alkalosis and thereby lend support

to the blood findings which previously identified magnesium tetany as a separate and distinct entity.

STUDIES ON MAGNESIUM DEFICIENCIES IN ANIMALS. VI. Chemical changes in the bone with associated blood changes resulting from magnesium deprivations. Elsa R. Orent, H. D. Kruse and E. V. McCollum. Jour. Biol. Chem., cvi (1934), 2, p. 573.

In magnesium deficiency the bone was unusually heavy and overly abundant in its absolute content of ash, calcium and phosphorus; the increased weight of the bone was due in a large measure to the excessive deposition of calcium. The heaviness of bone and its intensive calcification was maintained throughout the survival period. Although animals received an insignificantly small amount of magnesium, their bones showed an accumulation of this element. The rate of deposition of magnesium in the bone throughout the entire period of the deficiency was much slower than that of the other components. During the few seconds that passed before the first stage of induced convulsions was reached the magnesium level rose in the blood and dropped sharply in bone. This rapid mobilization of magnesium takes on interest in connection with the composition of the bone.

CROSS-INFECTION EXPERIMENTS ON PARASITE-FREE CHICKS WITH INTESTINAL COCCIDIA FROM THE RABBIT. Kenneth B. M. Crooks. Jour. Parasitol., xx (1934), 5, p. 277.

Measurements were made on 353 oöcysts obtained from rabbits that had died from coccidiosis. The species *Eimeria media*, described by Kessel and Jankiewicz in 1931 from California rabbits, has been identified in Virginia rabbits. Baby chicks fed large single doses of sporulated oöcysts of rabbit coccidia did not show any evidence of coccidial infection. Baby chicks, fed daily with small doses for three consecutive days, showed no evidence of coccidial infection. A baby chick fed large doses of rabbit coccidia on three successive days showed no evidence of being infected.

PIROPLASMA CANIS IN FLORIDA. Paul Eaton. Jour. Parasitol., xx (1934), 5, p. 312.

Piroplasma canis, a tick-borne Haemosporidan, said to cause malignant jaundice in dogs, was found in the blood of a dog which also harbored *Dirofilaria immitis*. This observation is of in-

terest in view of the remarkable increase in the prevalence of dog ticks in Florida. The piroplasms disappeared from the blood as did the microfilaria, after the intravenous injection of a proprietary organic antimony preparation. The piroplasms showed an especial predilection from reticulocytes, comparable to that which were recently shown to characterize the human malaria parasites, *Plasmodium vivax* and *Plasmodium falciparum*.

LOSSES AMONG WILD DUCKS DUE TO INFECTION WITH SPHAERIDIOTREMA GLOBULUS. E. W. Price, Proc. Helminth. Soc. of Wash., i (1934), 2, p. 31.

Three outbreaks of a fatal disease of ducks, the species in each instance being the lesser scaup (*Marila affinis*) were investigated. The postmortem lesions of birds from the three outbreaks were similar. A section of the small intestine, about 20 cm in length, 15 to 20 cm anterior to the cecums, was completely filled with a cast composed largely of fibrin and blood. The mucous membrane was highly congested and hemorrhagic and showed numerous small ulcerated patches. Numerous small trematodes were firmly attached to these ulcers. They were identified as *Sphaeridiotrema globulus*. The author concludes that the trematodes were the primary cause of the enteritis which resulted in the death of the birds, since they were found only in the inflamed portion of the intestine.

IMMUNIZATION AGAINST INFECTIOUS LARYNGOTRACHEITIS OF CHICKENS BY "INTRABURSAL" INJECTION OF VIRUS. J. R. Beach, O. W. Schalm and R. E. Lubbehusen. Poultry Sci., xiii (1934), 4, p. 218.

The finding of Beaudette and Hudson that the tissues of the cloaca and bursa of Fabricus of chickens are susceptible to the virus of laryngotracheitis; that infection of these tissues causes a chicken to become refractory to tracheal infection with the virus and that the phenomenon can be utilized as a means of vaccination of farm fowls against the disease has been confirmed. Application by means of a brush or swab of a glycerinated suspension of the virus to the cloacal mucous membrane has varied greatly in its effectiveness in the establishment of cloacal infection. This variation appeared to be related to the method of application of the virus. Vaccination by injection of the virus suspension directly into the bursa of Fabricus with a hypodermic syringe was found a more certain means of establishing cloacal

immunity. The general character of the take was the same. The intrabursal injection of virus caused no general or systemic reaction nor objectional after effects. The intrabursal injection can be made easily and is a practical method of vaccination. Fowls should be examined on the fifth day for the purpose of detecting or revaccinating those birds which do not exhibit a "take." Satisfactory results in intrabursal vaccination were obtained by using a 1:500 dilution of the desiccated virus which would produce infection when 0.1 cc of a 1:5,000 or a 1:10,000 dilution was injected intratracheally. Virus of lower virulence gave less satisfactory results. Twenty-eight fowls taken from vaccinated flocks at various times, from 64 to 300 days after vaccination, have been refractory to exposure to laryngotracheitis virus by intratracheal inoculation. Evidence is given to show that the intrabursal injection does not cause fowls to become carriers of the virus.

THE INFLUENCE OF ALTITUDE ON TUBERCULOSIS IN GUINEA PIGS. Ludwig Lange. Abst. Arch. Path., xviii (1934), 3, p. 436.

Extensive, identical experiments were conducted simultaneously at four altitudes (sea level to 3,100 meters). At each station the animals were divided into two groups, one of which was kept in the dark and the other in diffuse daylight. In addition a portion of the latter were sensitized to light with eosin. Some of the guinea pigs were allowed to become acclimated to the altitude before the start of the experiments, and others were inoculated immediately on arrival at the respective stations. All were given injections of similar amounts of identical strains of tubercle bacilli. Records were kept of duration of life and changes in weight, and on autopsy studies were made of the histological aspects or distribution of the disease. The only significant findings were that the lowest death-rate occurred in the non-sensitized animals kept in the daylight, and the highest death-rate in the eosin-sensitized animals kept in the light at high altitudes. No other significant deviations as between the different stations were noted.

EXPERIMENTAL TUBERCULOSIS OF THE BONES. M. Mandelstamm. Abst. Arch. Path., xviii (1934), 3, p. 437.

Rabbits were inoculated with bovine tubercle bacilli intraärticularly, intracardially and subcutaneously. Metastatic tubercles appeared in all elements of the bony system except the fat marrow. In general they were distributed perivascularly, the arteries

themselves, however, never showing any tuberculous infiltrations. The tubercles that appeared in the myelogenous bone-marrow of the diaphyses did not caseate, while those which appeared in the metaphyses developed more rapidly and frequently caseated. Thus clinical experimental bone tuberculosis in the rabbit starts in the epiphyseal region. This is interpreted as evidence of significant variation in local resistance of specific tissue.

NASAL GRANULOMA IN CATTLE. G. Dikmans. Proc. Helminth. Soc. of Wash., i (1934), 2, p. 64.

A disease was investigated which was manifested clinically by an obstruction to respiration and histologically by the formation of granulomatous tissue in the anterior part of the nasal cavities. The cause of the disease was not determined, but certain peculiarities of the lesions suggested that the condition might be due to an animal parasite. Attempts to find an animal parasite failed. Certain bodies have appeared both in the nasal secretions and in the nasal mucosa of the infected animals. These bodies appear to have an etiological relation to the disease, and have some resemblance to those associated with rhinosporidiosis.

THE USE OF PREGNANCY URINE AND PROLAN IN ANIMAL INDUSTRY. E. P. Tchernozatonskaia. Endocrin., xviii (1934), 4, p. 482.

A series of experiments to stimulate the growth of flesh and fat in animals were carried out. Fifty-eight rabbits were used (20 controls and 38 experiment animals). The injection of prolan (13 animals) or gravidan (23 animals) in dosages from 3 to 5 cc per kilo of body weight produced an increase in flesh and fat in the experiment animals as compared to that in the controls on the same diet. Two animals injected with normal urine also gave a weight increase over the controls. The weight of the animal was a necessary consideration in the determination of dosage. Prolan was more expensive to prepare, was more toxic when given in larger doses and was less potent in the stimulation of growth of flesh and fat than was gravidan.

THE MODE OF ACTION OF IMMUNE SERUM IN SWINE ERYSIPELAS. Dezso Gajzago. Abst. Arch. Path., xviii (1934), 3, p. 442.

Gajzago studied the effects of passive immunization of mice and pigeons with an antiserum for *Erysipelothrix rhusiopathiae*.

He observed no bactericidal action and found no injurious effects on the microörganisms. Phagocytes played an important rôle, although bacteriotropins were not exclusively concerned inasmuch as serums in which bacteriotropins had been removed by saturation still were protective. Bacteria injected intraperitoneally into immune animals agglutinated in the peritoneal cavity and were more effectively phagocytosed than in normal animals. Furthermore, bacteria could be recovered from the blood-stream of the normal animal for from one to two days, whereas in the immune animals the microörganisms persisted in the blood-stream only to the third hour.

National Live Stock Loss Prevention Board

After more than three years of patient effort on the part of the Organizing Committee to complete plans for the formation of the National Live Stock Loss Prevention Board, the plans are now in order and the Board ready to start on the program to which it is committed.

According to the proposed Constitution and By-Laws for the Board, "The object of the organization shall be to initiate and encourage education and research, to correlate and coördinate present activities and information, to secure new data, to disseminate correct information and to promote practical and proper methods of reducing and eliminating preventable live stock losses during the marketing process."

Contributors who are supporting the activities of the Board for the coming three years include: 18 railroads, 16 stock yard companies, three live stock exchanges, two state live stock loss prevention associations, one insurance company, the American Veterinary Medical Association, the Institute of American Meat Packers, the National Live Stock Marketing Association and the Sanitary Committee of the National Live Stock Exchange.

The Organizing Committee has also named 18 men to constitute the personnel of the Board for the first year with full power to act. This group will get the work started, propose a constitution and by-laws and set up administrative facilities during the period of its incumbency. This will insure getting the work under way promptly and serve as a temporary medium pending the establish-

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There are some defeats more triumphant than victories.—MONTAIGNE.

Regular Army

Captain Harry R. Leighton, now on temporary duty in Seattle, Wash., is relieved from further assignment and duty at Fort Lewis, Wash., and will report to the commanding officer, Seattle quartermaster depot, for duty.

The promotion of 1st Lt. Charles S. Greer to the grade of captain, with rank from October 10, 1934, is announced.

Major James E. Noonan is relieved from duty at San Francisco port of embarkation, Fort Mason, Calif., effective at such time as will enable him to proceed to San Francisco, Calif., and sail on transport scheduled to leave that port on or about January 4, 1935, for the Philippine Department.

Major Will C. Griffin in assigned to duty at the Army Medical Center, Washington, D. C., effective upon completion of his present tour of foreign service in the Philippine Department.

The promotion of 1st Lt. John L. Owens to the grade of captain, with rank from October 29, 1934, is announced.

Veterinary Reserve Corps

New Acceptances

Brown, Douglas Robert..2nd Lt..105 S. McKinny, Ennis, Tex.
Schrumpf, Henry Russell.2nd Lt..342 S. W. First St., Richmond, Ind.

Promotion

To

Moe, Lewis H.....Capt....711 Jefferson, Stillwater, Okla.

Transferred to Aux. Reserve

Lillyman, Frank Guard..Major...1519 8th St., Des Moines, Iowa.

Winter Feeding of Wildlife

Because of the drouth the past summer, winter this year looms as a serious barrier to the progress that is being made in the national program of wildlife restoration, according to the *American Field.* Biologists of the U. S. Bureau of Biological Survey are asking the coöperation of interested organizations in a winter-feeding campaign. Helpful suggestions are contained in a bulletin published by the U. S. Department of Agriculture, entitled "Winter Feeding of Wildlife on Northern Farms."

TWELFTH INTERNATIONAL VETERINARY CONGRESS

Motion Pictures at the I.V.C.

Both as a diversion and as a means of distributing scientific knowledge, a program of motion pictures was shown daily during the first four days of the International Veterinary Congress. The films were screened in a large foyer adjoining the main ballroom of the Waldorf-Astoria Hotel. The motion-picture program began at 5 p. m. each day and continued for about an hour. It consisted of selected and recently revised films produced by the U. S. Department of Agriculture under the direction of specialists of the Bureau of Animal Industry, except that one film on salmon-fluke poisoning was prepared and shown by the Oregon Agricultural College. The government pictures were as follows:

"Southern Cattle Yesterday and Today," portraying the gradual eradication of cattle ticks from infested southern states and the resulting improvement in beef and dairy herds.

"Suppressing Foot-and-Mouth Disease," which is a pictorial record of outbreaks of the malady on several occasions in the United States and the vigorous and effective American method of controlling the disease. The picture also explains the scientific nature of the disease and the necessity for public coöperation in support of veterinary procedures.

"Clean Herds and Hearts," being a humanized presentation of the problems of eradicating bovine tuberculosis under the area plan. It illustrates sources of opposition and methods of overcoming them and bringing local campaigns to successful conclusion.

"The Horse in Motion," which is a study of the various gaits of horses, first at normal speed and then analyzed by means of slow-motion photography. The film shows draft horses, pacers, trotters, runners, hunters, cavalry and police horses.

"Sheep in Psalm and Sage," being a photographically impressive presentation of the significance of sheep to man. The photography is largely in the scenic areas of the West.

"This Little Pig Stayed Home," being a story picture of the experience of a Corn Belt farm family with hog cholera. The danger of the disease and also methods of prevention are effectively shown.

"The Beefsteak Bequest," which is a story of Sni-a-Bar farm in Missouri and the results of experiments conducted to determine the benefits derived through the use of purebred sires in beef-cattle production.

The Oregon film on salmon-fluke poisoning was based on the excellent research work of Drs. B. T. Simms and J. N. Shaw in protecting dogs against infection by this parasite. The film deals with both the scientific and practical aspects of a problem peculiar to the Northwest where dogs frequently eat salmon that harbor the injurious fluke.

Besides acquainting visitors of the International Veterinary Congress with the veterinary procedures which formed the basis of the pictures, the motion-picture program proved to be a valuable means of familiarizing foreign visitors, in particular, with general live stock conditions, types of animals, and other details incidental to the main purpose of the films. D. S. B.

Contributions

The following list shows the contributions to the general fund of the Congress made by veterinary and allied organizations. This list was published in installments during the past year, as the contributions were received. It has been thought advisable to publish the entire list at this time.

American Veterinary Medical Association	$5,000.00
Army Veterinary School	81.00
B. A. I. Veterinarians, National Association of	500.00
California State Veterinary Medical Association	500.00
Connecticut Veterinary Medical Association	278.00
East Tennessee Veterinary Medical Association	10.00
Hudson Valley Veterinary Medical Society	200.00
Illinois State Veterinary Medical Association	500.00*
Intermountain Live Stock Sanitary Association	50.00
Kansas Veterinary Medical Association	51.00
Long Island Veterinary Medical Association	100.00
Manitoba, The Veterinary Association of	25.00
Maryland State Veterinary Medical Association	134.00
Massachusetts Veterinary Association	100.00
Michigan State Veterinary Medical Association	112.50†
Minnesota Veterinary Medical Society	250.00
Mississippi State Veterinary Medical Association	25.00
Missouri Veterinary Medical Association	100.00
Nebraska State Veterinary Medical Association	100.00
Nevada State Veterinary Association	25.00
New Hampshire Veterinary Medical Association	100.00
New Jersey, Veterinary Medical Association of	300.00

*Includes a contribution of $300.00 made by the Committee on Local Arrangements for the 1933 A. V. M. A. meeting in Chicago.

†Part of an appropriation of $250.00 made by the Michigan Association. The balance is impounded in a closed bank.

New York City, Veterinary Medical Association of	240.10
New York State Accredited Veterinarians' Association, Inc.	25.00
New York State Veterinary Medical Society	500.00
North Carolina State Veterinary Medical Association	25.00
Northeastern Pennsylvania Veterinary Medical Club	50.00
Northwestern Ohio Veterinary Medical Association	100.00
Ohio State Veterinary Medical Association	250.00
Oklahoma Veterinary Medical Association	50.00
Ontario Veterinary Association	100.00
Oregon Veterinary Medical Association	50.00
Pennsylvania State Veterinary Medical Association	500.00
Quebec, College of Veterinary Surgeons of the Province of	50.00
Rhode Island Veterinary Medical Association	100.00
Saskatchewan, Veterinary Association of	50.00
Schuylkill Valley Veterinary Medical Association	10.00
South Carolina Association of Veterinarians	50.00
Southern States Veterinary Medical Association	150.00
Tennessee Veterinary Medical Association	25.00
Texas, State Veterinary Medical Association of	100.00
United States Army Veterinary Officers	92.00
United States Live Stock Sanitary Association	1,000.00
Vermont Veterinary Medical Association	100.00
Virginia State Veterinary Medical Association, Women's Auxiliary of	25.00
Washington State Veterinary Medical Association	25.00
West Virginia Veterinary Medical Association	25.00
Western New York State Veterinary Medical Association	100.00
Wisconsin Veterinary Medical Association	100.00
	$12,433.60

Unusual Careers

To the average person, veterinary medicine seems about as unlikely a profession for women as can be imagined. Yet the International Veterinary Congress this year drew a considerable attendance of women. Also this year, the official publication of the National Veterinary Medical Association of Great Britain and Ireland published a "ladies' number" dealing with outstanding women veterinarians.

Dr. John R. Mohler of the United States Department of Agriculture points out that some of the most important research in veterinary science has been carried on by women and further that an increasing number are engaging in actual practice, especially in England, but to a less extent in the United States.

Our wonderment at women veterinarians represents pure prejudice, for the field embraces subjects of special interest to homemakers, who constitute the majority of women. Inspection of meat, safeguarding of milk, and proper care of pets—all of which topics are in the veterinary field—are important to the home. Achievement will in time conquer the prejudice that exists.

NELSON ANTRIM CRAWFORD in the *Household Magazine*.

AMERICAN VETERINARY MEDICAL ASSOCIATION

Resume of Minutes of Annual Meeting of the Executive Board, New York, N. Y., August 12-16, 1934

The annual meeting of the Executive Board of the American Veterinary Medical Association was convened at the Waldorf-Astoria Hotel, New York, N. Y., Sunday morning, August 12, 1934, at 10:30 a. m.

The following were in attendance: Dr. R. S. MacKellar, Chairman and Member-at-Large; Dr. A. E. Cameron, District 1; Dr. E. P. Althouse, District 2; Dr. L. A. Merillat, District 3; Dr. C. A. Cary, District 4; Dr. F. F. Parker, District 5; Dr. L. M. Hurt, District 6; Dr. J. C. Flynn, District 8; Dr. H. W. Jakeman, District 9; Dr. O. V. Brumley, District 10; Dr. C. P. Fitch, President; Dr. M. Jacob, Treasurer; and Dr. H. Preston Hoskins, Secretary-Editor.

1. The minutes of the special meeting of the Executive Board held in December, 1933, were read and approved.

2. A motion prevailed to approve the expense account of President Fitch, incurred in attending the Short Course at the University of Missouri, January 30-31 and February 1, 1934.

3. A discussion took place relative to the action taken by the Board at the December, 1933, meeting, authorizing the Secretary to prepare an itinerary for the incoming President. The desirability of having the President attend just as many meetings as possible was brought out, and a motion prevailed that it be the sense of the meeting that an effort be made to have some representative of the A. V. M. A. attend a meeting of each state and provincial association at least once each year.

4. Treasurer Jacob presented a financial report covering the period from January 1 to June 30, 1934. (Published in the October, 1934, issue of the JOURNAL, p. 491.)

5. Treasurer Jacob then reported the history and present status of the litigation in connection with the $5,500.00 in government bonds, registered in the name of the Salmon Memorial Fund, which were involved in the closing of the East Tennessee National Bank, Knoxville, Tenn. Dr. Jacob reported the decision rendered in favor of the A. V. M. A., but pointed out that the receiver for the bank had 90 days in which to file an appeal and this period would not expire until some time in October.

6. Treasurer Jacob further reported that a new bank had been organized in Knoxville, to take over the business of the closed East Tennessee National Bank in which the A. V. M. A. had some funds when the bank closed. Dr. Jacob said that there was a

good prospect of the depositors being paid in full over a period of time.

7. The administration of the Student Loan Fund of the Women's Auxiliary, in its relation to the possible future use of the Salmon Memorial Fund for student loan purposes, was discussed, and it was decided that a conference be held between the Special Committee on Student Loan Fund and the officers of the Women's Auxiliary.

8. Treasurer Jacob was authorized to hold the Salmon Memorial Fund bonds, or the proceeds of the bonds should they be redeemed, and in the event of the bonds being turned over to him by the receiver for the East Tennessee National Bank, in a bank to be determined by himself, until the December meeting of the Board.

9. The Board adopted a resolution prepared by the Association's attorney, Mr. Kotz, authorizing the Treasurer of the A. V. M. A. to invest funds of the Association in such securities as the Board may designate from time to time, the resolution also authorizing the Treasurer to draw a check against the funds of the Association for the purchase of such securities whenever necessary.

10. The desirability of publishing only one Treasurer's report each year, instead of two semiannual reports, was discussed and a decision was left in the hands of the Secretary and Treasurer.

11. Dr. L. A. Merillat reported on the status of his history of the Army veterinary service and explained in detail what the work would include. He suggested that the A. V. M. A. purchase the first 500 copies, these either to be resold or donated to libraries and educational institutions. A motion prevailed that the committee appointed to examine the material for the book be authorized to draw up a definite sales policy for presentation to the Board at the next meeting.

12. A communication from a large publishing house was read. In substance, this letter asked that the A. V. M. A. provide a committee which could be consulted by the publisher, with a view of determining the desirability of publishing new veterinary books and deciding questions in connection therewith. A motion prevailed to have a special committee of three members go into this matter and report at the next meeting.

RECESS

The meeting was reconvened at 1:15 p. m.

13. Dr. J. C. Flynn, chairman of the Special Committee on N. R. A., presented a report. He was followed by Dr. C. P.

Fitch, who reported on his attendance at a meeting of the Coördinating Committee of the Baby Chick Hatchery Association, in Cleveland, on July 26-27-28, 1934. Dr. Fitch reported that the representatives of the hatchery industry who attended the meeting had received his various suggestions for veterinary control measures very kindly.

14. The report of the Committee appointed to study the recommendations made by ex-President Williams was discussed. The recommendation having to do with the election of the President of the A. V. M. A. by mail ballot was discussed at considerable length, in connection with the suggestion that the President should be elected one year in advance of the date of taking office. Finally it was decided that the Board recommend to the A. V. M. A. House of Representatives that that body nominate three candidates for President-elect, to be voted upon by mail ballot. It was agreed also that it would be in order for the President-elect to become an ex-officio member of the Executive Board, to take the place of the immediate Past-President.

15. Dr. Flynn reported for the Special Committee on Dog Foods, stating that a number of manufacturers of dog foods were desirous of having the A. V. M. A. provide the necessary machinery for examining and passing on these products. It was the consensus of opinion that it would not be feasible for the A. V. M. A. to provide this service.

16. The Committee on Advertising had no report to make, and a motion prevailed to defer the presentation of this report until the next meeting.

17. A communication from Dr. E. M. Nighbert was read, containing three resolutions. After a brief discussion of these resolutions, the communication was referred to the Committee on Resolutions, without recommendation.

18. The Secretary presented a number of resignations, all of which were accepted. (See list in the Report of the Secretary-Editor, published in the October, 1934, issue of the JOURNAL, pp. 483-484.)

19. The Secretary reported on the payment of dues of A. V. M. A. members and stated that he had been lenient in enforcing the provisions of the By-laws, covering the dropping of members for the non-payment of dues, in practically all cases where extensions had been requested. This action was approved.

20. The cost of reprints of articles published in the JOURNAL was discussed, and the Secretary was authorized to make a further study of these costs and report to the Board at the next meeting.

21. The Board fixed the amount of the bond of the Secretary at $10,000.00.

22. The desirability of publishing a new A. V. M. A. membership directory was discussed and, on motion, action in the matter was postponed until the 1935 meeting.

23. A motion prevailed that the expenses of the members of the Board, incurred in attending the meeting, be paid by the A. V. M. A. in those cases where these expenses were not otherwise provided for.

24. The Secretary read a communication from Dr. Cliff B. Carpenter, of Los Angeles, Calif., containing the very kind offer of Mrs. Carpenter to paint the portraits of presidents of the A. V. M. A. A motion was adopted accepting the offer with the thanks and appreciation of the Board.

25. The question of the proper credentials for members of the House of Representatives was discussed. It was decided to suggest to the House that it should make definite rules covering the matter of the proper credentials of its own members.

26. The Secretary asked for an interpretation of the words "in good standing," applied to members of the A. V. M. A., used in determining the voting strength of each state in the House of Representatives. It was the sense of the Board that the phrase "in good standing" referred definitely to the payment of dues, and in counting the number of A. V. M. A. members in each state, only those whose dues were paid to date on August 1 of each year should be included.

27. The question of a presiding officer for the first meeting of the House of Representatives brought out some discussion, inasmuch as the Constitution and By-laws made no provision for the same. It was decided to have the Secretary call the first meeting to order and then have the election of a presiding officer as the first order of business following the roll-call.

28. The recommendation of President Fitch, for amending the Constitution and By-laws to provide for the President presiding over the House of Representatives, was approved and recommended to the House.

29. Dr. R. S. MacKellar was reëlected chairman of the Board for the ensuing year.

ADJOURNMENT

The Board met again on August 16, at 11:00 a. m.

The following were in attendance: Dr. R. S. MacKellar, Chairman and Member-at-Large; Dr. A. E. Cameron, District 1; Dr. E. P. Althouse, District 2; Dr. L. A. Merillat, District 3; Dr. C. A. Cary, District 4; Dr. F. F. Parker, District 5; Dr. L. M.

Hurt, District 6; Dr. J. C. Flynn, District 8; Dr. H. W. Jakeman, District 9; Dr. O. V. Brumley, District 10; Dr. C. P. Fitch, President; and Dr. H. Preston Hoskins, Secretary-Editor.

30. The recommendations contained in the address of President Fitch were discussed, and a motion prevailed that the Board approve these recommendations and refer them to the House of Representatives. These recommendations included the employment of an assistant to the Secretary-Editor; the creation of a permanent committee on public relations, to replace the Special Committee on Agricultural Extension Service, and the creation of a new class of members who do not hold a veterinary degree.

31. Dr. MacKellar, having been elected to the presidency of the A. V. M. A., pointed out that it would be in order for the Board to elect a new chairman. Dr. Cassius Way, Member-at-Large, was elected to the office.

ADJOURNMENT

Dental Exhibit Subject of Booklet

To 8,000,000 persons, at least, the necessity for caring for the teeth properly was emphasized vividly and dramatically in the Exhibit for Dentistry at A Century of Progress, Chicago, which closed on October 31, 1934. The exhibit, which was a study of both preventive and curative dentistry from the time of the early Egyptians down to the present, was operated under the auspices of the American Dental Association and the Chicago Dental Society by the Chicago Centennial Dental Congress.

That the lesson taught by the exhibit may be disseminated even more widely, a booklet has been prepared which covers the high points of the lectures presented, the motion-pictures shown and the dioramas and models on display. The booklet has been prepared especially to supply material for lectures on dental health.

The exhibit represented a coöperative effort that is worth special mention. Forty-nine firms, that are connected in one way or another with dental health, contributed liberally to the fund that made the exhibit possible. Included in this list of contributors were pharmaceutical laboratories, makers of dental instruments, makers of tooth paste, manufacturers of artificial teeth, gold refiners and many others.

The Horse Association of America has changed its name to the Horse and Mule Association of America.

The Minnesota Decision

On November 3, 1934, the District Court of Dakota County, Minnesota, filed its decision in a case entitled, "E. L. Orput, plaintiff, *vs.* Saint Paul Union Stockyards Company *et al*, defendants," whereby a permanent injunction is ordered, restraining the Saint Paul Stockyards Company from practicing veterinary medicine, including the making of tuberculosis tests, short and long method blood tests, vaccination against hemorrhagic septicemia and blackleg, and any and all other veterinary services which only licensed veterinarians may perform under the statutes of the State of Minnesota.

This decision is the culmination of a legal controversy between private practicing veterinarians engaged in testing cattle for contagious and infectious diseases at the Saint Paul Union Stockyards, at South Saint Paul, Minn., and the Stockyards Company, and involves fundamental questions of law regarding the practice of veterinary medicine.

It has been decided previously by the supreme courts of several states that no corporation could practice other skilled, licensed professions, such as medicine, dentistry, law, optometry and so on, but, as far as we know, no such case has specifically come before the courts involving the status of veterinarians, and in the instant case, of course, there has as yet been no opinion handed down by a court of last resort.

A brief summary of the Orput case is as follows:

In March, 1934, the Saint Paul Union Stockyards Company, in the belief that it was acting within its rights under the Packers and Stockyards Act, filed a schedule of charges for makng the tests above enumerated. For performing these tests, the Stockyards Company proposed to hire a duly qualified, licensed veterinarian on a salary basis, to do the actual testing. The Stockyards Company then would collect and keep the money so charged for such tests, in the hope of making a profit.

The charges, as outlined in the schedule filed with the Secretary of Agriculture of the United States, were very much less

than the charges being made by private veterinarians. In fact, some of the charges proposed by the Stockyards Company were only about 50 per cent of the charges made by private veterinarians. The company claimed that it could thus reduce these charges and still make money. Private veterinarians contended that the charges proposed by the Stockyards Company were below the cost of doing business, as conducted by private veterinarians, and that if the private veterinarians were to compete with these charges, as fixed by the company, they would be forced out of business.

The Stockyards Company did, in fact, put the plan into operation, but, after operating for just two days, was restrained by a temporary injunction which has since become a permanent injunction, after the trial of the case and the filing of briefs.

The basis of the claims of the plaintiff who brought the suit for injunction, on behalf of himself and all other private veterinarians practicing at the South Saint Paul Stockyards, was as follows: that the Saint Paul Union Stockyards Company in doing what it proposed to do, namely, hiring a veterinarian to perform the tests on a salary basis and collecting the charges therefor for its own profit, was, in fact, practicing veterinary medicine; that under the laws of the State of Minnesota only a person who has had a certain required education and has passed an examination given by the State Board and has been granted a license is entitled to practice veterinary medicine. Obviously, a corporation can not qualify under this law; that, therefore, the Stockyards Company in doing what it proposed to do was practicing the profession of veterinary medicine illegally.

On the other hand, the Stockyards Company claimed, among other things, that the animals tested, and the Stockyards Company itself, are both in interstate commerce and that the State licensing law, therefore, did not control the situation in this case.

It contended also that the Packers and Stockyards Act included the testing of cattle for contagious and infectious diseases, among the other services which stockyard companies were authorized to perform.

The private veterinarians countered with the contention that the State licensing law came into being by virtue of the inherent police power of the respective states; that each state has the inherent power to protect the public health and morals of its own people and that this power never had been granted by the states to the federal government and, therefore, that the State licensing law was superior to a federal law, unless such police regulation of

the State should result in an unreasonable burden upon interstate commerce, in which case the State regulation would have to bow to federal authority. There was no showing, however, that the testing of these cattle by private veterinarians was an undue or unreasonable burden upon interstate commerce. The plaintiff contended also that the Packers and Stockyards Act merely contemplated the regulation of charges for the stockyard services enumerated therein and never contemplated authorizing any marketing agency going into the business of protecting the public health and the preventing of disease.

The outcome of this case is of vital importance to the entire veterinary profession, in that, if the present decision of the District Court is upheld in the Supreme Court, it will definitely establish the profession of veterinary medicine on the same plane as other skilled, learned and licensed professions, and definitely free it from the encroachment of corporations which may desire to enter the field. There have been many and varied schemes by promoters or corporations to take over the work of licensed professions, with a view to handling professional matters on a large-volume, reduced-fee, impersonal basis.

Following is the conclusion signed by the District Judge in the case:

> That said defendant, Saint Paul Union Stockyards Company, its agent, said defendant I. O. Burington, and all its other agents and servants, be restrained by injunction from practicing veterinary medicine, including the making of tuberculosis tests, short and long method blood tests, vaccination for hemorrhagic septicemia or black leg, or any and all other veterinary services which only licensed veterinarians can perform under the statutes of the State of Minnesota, except scabies and cattle tick fever, and that plaintiff have his costs and disbursements herein.

(This summary of the decision of the lower Court was prepared by Attorney K. D. Stalland, who presented the case for the practicing veterinarians.)

Ready for the International

The stock show pavilion at the Union Stock Yards, Chicago, Ill., which was destroyed by fire May 19, 1934, has been rebuilt and is now ready for the International Live Stock Exposition. The new building has 255,000 square feet of floor space, and is said to be the largest structure of its kind in the United States. It will seat more than 12,000 persons, and has ample parking space for 5,000 cars on a concrete floor outside the building. Completion of the building is expected to bring Chicago to the fore as one of the greatest convention cities in the world.

Tuberculosis Eradication Stepped Up

Emergency funds are speeding up the work of eliminating tuberculous cattle from the herds of the various states, a work that is being done by the U. S. Bureau of Animal Industry in coöperation with the state live stock sanitary authorities. The appropriation under the Jones-Connally Act has stimulated great activity in eradication work in New York and California, and there has been a noticeable increase in several other states. Part of the appropriation pays for operating expenses, but most of it will go to cattle owners as indemnity payments for reactors that are being removed from herds.

In New York, approximately 100,000 reactor cattle will have been removed during the six-month period ending January 1, 1935. In California, it is expected that initial testing of all herds in the state will be completed before the end of 1935. In Imperial County, in the southern part of the state, more than 5,000 reactors were removed in the first 60 days of testing, and the work is getting under way in the central part of the state. Considerable testing is under way in 31 other states. In Iowa, in July, August and September, about 12,000 reactors were removed for slaughter. Officials expect that all initial testing will be completed in Iowa during the next few months.

The new regulations differ from those used in the regular conduct of the work principally in allowing states to participate in eradication work whether or not they expend any of their own funds for indemnities or for the cost of testing. The total amount received as indemnity from all sources plus the salvage obtained cannot exceed the appraised value or an amount the owner would receive under the existing plan in his state. Payments for cattle found to be tuberculous are on the basis of a maximum of $20 a head of federal money for grade cattle and $50 for registered purebred cattle.

Ohio State University Broadcasting Program

The College of Veterinary Medicine at Ohio State University is sponsoring a radio broadcasting program that extends over the entire academic year. It is the aim of the College to put on programs that will acquaint the public with the scope of the services of the veterinarian and show his relation to the welfare of the health of the community. The programs, which are weekly, are broadcast from 7:15 to 7:30 p. m. every Friday, over station WOSU (570 KC). The talks are given by veterinarians who are

in the service of the federal government, the State of Ohio, Ohio State University or the City of Columbus.

The following talks have already been given this season:

October 5—"Outline Radio Program," Dr. O. V. Brumley.
October 12—"What Is Bang's Disease?" Dr. A. J. DeFossett.
October 19—"Economic Importance of Bang's Disease," Dr. D. C. Hyde.
October 26—"Bang's Disease Relationship to Public Health," Dr. O. V. Brumley.
November 2—"Bang's Disease Control," Dr. H. W. Bond.
November 9—"How White Plague (Tuberculosis) Affects Chickens," Dr. L. W. Goss.
November 16—"Cattle Tuberculosis Dangerous to the Human Family," Dr. A. F. Schalk.
November 23—"Certainly, Chickens Have Tuberculosis," Dr. W. R. Hobbs.
November 30—"How to Finish the Fight on Cattle Tuberculosis," Dr. A. J. DeFossett.

The following program has been announced for December and January:

December 7—"No NRA Code for the Louse," Dr. R. E. Rebrassier.
December 14—"Damaged Sweet Clover Hay May Produce Bleeders in Cattle," Dr. A. F. Schalk.
December 21—"When and How to Fight the Horse Bot," Dr. W. R. Krill.
January 4—"Teething in Our Baby Animals," Dr. J. D. Grossman.
January 11—"See Your Dentist Once a Year," Dr. W. F. Guard.
January 18—"Winter Sports for the Ewe," Dr. J. D. Grossman.
January 25—"Baby Chick Hazards," Dr. J. T. Burriss.

The program for February and March will be published in the February issue of the JOURNAL.

Mastitis Included in AAA Program

Announcement that the Agricultural Adjustment Administration has authorized the use of funds made available under the LaFollette amendment to the Jones-Connally Act, in payment of indemnities for the removal of cows showing cases of mastitis, under regulations supervised by the U. S. Bureau of Animal Industry in coöperation with state live stock sanitary officials, was made early last month.

Work on tuberculosis and Bang's disease by the Bureau of Animal Industry under the emergency appropriation has been under way for several months. The plan to include some mastitis work was recommended by milk-producers, cattle-breeders and veterinarians. The disease is regarded as a serious menace to herd health in many sections of the country.

Following the removal of cows showing symptoms of infection with mastitis, the owners must agree to follow rigid sanitary safeguards against a recurrence of the disease. The same rate of indemnity which is paid for reactors to tuberculosis and Bang's disease ($50 maximum for purebred registered animals and $20 for grade animals) will be the rule in mastitis work.

It is further proposed to conduct the mastitis control work only in cases where the owners of herds have carried on testing for tuberculosis and Bang's disease under state and federal supervision, or where the owner agrees to carry on Bang's disease work as soon as feasible. Contracts with herd-owners for mastitis control will be always subject to acceptance by the Chief of the Bureau of Animal Industry and the respective state veterinarians, according to the merits of each case.

As soon as the official regulations for mastitis work are completed, a pamphlet will be issued by the U. S. Bureau of Animal Industry, containing instructions to be followed by herd-owners who sign up for the work and who receive indemnity on removal of cows infected with mastitis. The details of the examination of cows and payment of indemnity will be in charge of the U. S. B. A. I., although the funds are provided by Congress to the Agricultural Adjustment Administration.

More 1934 Graduates

Seven candidates for the degree, Doctor of Veterinary Medicine, were presented by Dean R. R. Dykstra, of the Division of Veterinary Medicine, Kansas State College, at the close of the summer session on August 3, 1934:

Buford Bridges
John Mark Hurd
William E. Ivey
Otto Walter Ludloff
Lucius E. McGee
Elmer Metcalfe
James Rudolph Whitman

Two candidates were presented at Iowa State College, by Dean C. H. Stange, of the Division of Veterinary Medicine. Gerald H. Long received the degree, Doctor of Veterinary Medicine, at the close of the first summer session, July 19, and Donald F. Eveleth, at the close of the second summer session, August 25, 1934.

Three graduates of the College of Veterinary Medicine, Alabama Polytechnic Institute, were presented by Dean C. A. Cary to receive their degrees at the close of the summer session:

B. F. Balthaser
H. C. Dillon
A. R. Mathews

It is desired at this time to make amends to Dr. Frederick L. Barshinger, who should have been listed with the class that was graduated from the University of Pennsylvania, June 20, 1934.* Through error, Dr. Frederick William Spranklin was named twice.

THE GREAT QUINTET

Laennec, Koch, Roentgen, Von Pirquet, Trudeau

Advance in human knowledge is not accidental. It results from the work of men capable of building higher on the foundation of established facts. Nowhere in science is this better shown than in the age-old conflict which man has waged against his arch enemy —tuberculosis. Among the army of builders who have contributed to our present-day knowledge of this scourge, five names lead all the rest.

The first of these, Laennec, recognized a hundred years ago, that more accurate knowledge of the disease must precede any hope of its control. The old method of searching for tell-tale sounds in the lungs by pressing the ear to the chest was not enough. One day he saw a boy scratching one end of a log while a companion listened to the sounds transmitted at the other. He applied the law of conductivity of sound to the diagnosis of tuberculosis in the lungs—and our modern stethoscope is the result.

Fifty-two years ago, on March 24, 1882, Robert Koch announced that he had discovered a germ always present in active tuberculous disease and had produced tuberculosis by injecting it into animals. He named his new discovery the tubercle bacillus. Laennec, through the perfecting of diagnosis, Koch through the discovery of the cause, made their respective and momentous contributions toward the conquest of tuberculosis. Both recognized, however, that some method of still earlier diagnosis was needed, for the disease is vastly more curable when detected in its very beginning before it is revealed by auscultation and before the tubercle bacilli can be found in the sputum from infected lungs.

It was reserved for Roentgen to disclose the next great step in early diagnosis. A distinguished physicist, Roentgen was

*Jour. A. V. M. A., lxxxv (1934), n. s. 38 (1), p. 133.

experimenting with the tubes invented by Dr. Crookes for the purpose of passing an electric discharge through a vacuum. Roentgen made the startling discovery that reflected from the negative pole were some mysterious rays, capable of passing through solid substances impenetrable to light. He photographed the human body and revealed the bone and organs of a living man. With improved technic, the X-ray is now used as our surest method of discovering the spots and shadows in an infected lung which prove the presence of active or quiescent tuberculous disease.

The fourth great scientist, Von Pirquet, added the last significant refinement in diagnostic procedure—the skin test which has been given his name. This discovery was based on the previously known fact that people suffering even mildly from certain diseases, or who have previously suffered from them, develop changes in their bodies which make them sensitive, as we say, to that particular disease. By the use of tuberculin, a harmless liquid secured from cultures of tubercle bacilli, Von Pirquet made skin tests on individuals suspected of having tuberculosis in its early stages. If the skin grew red on the second day, he called the test positive since it indicated that the patient had been infected at some time with tuberculosis.

Laennec, Koch, Roentgen, Von Pirquet, these are the immortals whose glory lies in their successive contributions to the warfare against an enemy which has claimed more human victims than all the wars of history. Each built anew on the firm foundations laid by his predecessors, and the structure they have reared is the monument to their undying fame.

With these methods of early diagnosis perfected there remains only the discovery of a specific cure. To date, none has been found. The most important contribution along this line was made by Dr. Edward Livingston Trudeau, a young New York physician, who went to Saranac Lake, N. Y., in 1873 to await death when informed he had tuberculosis. In those days it was taken as a matter of course that anyone who had the disease would die. He discovered that the more he rested the better he felt. He was soon convinced that rest was absolutely necessary if a person with the disease was to recover, and when his health improved, he opened, in 1884, a small one-room cottage for the treatment of others. This cottage, called the "Little Red" because of its color, proved to be the nucleus of the huge sanatorium which today bears Dr. Trudeau's name, and the beginning of the sanatorium movement in the United States.

The regimen of fresh air, good food, and rest devised by Dr. Trudeau never has been improved upon and is still used today as the standard treatment in curing the disease.

The fiftieth anniversary of the opening of the "Little Red" falls in February, 1935. To commemorate the occasion, a picture of the cottage appears this year on the Christmas Seals sold by the affiliated tuberculosis associations throughout the country to finance their fight against the disease. Those who purchase the penny seals to decorate their holiday letters and packages will not only be assisting to overcome the nation's greatest public health problem, but will be paying a tribute to one of America's medical heroes.

Wellcome Research Institution Exhibit

A booklet commemorative of the 1934 A Century of Progress Exposition, Chicago, has been issued by the Wellcome Research Institution of London, England. It contains 90 pages, is cloth-bound and is profusely illustrated. The first 40 pages are devoted to a history of the Institution and its affiliated research laboratories and museums: Bureau of Scientific Research, Entomological Field Laboratories, Physiological Research Laboratories, Chemical Research Laboratories, Museum of Medical Science and Historical Medical Museum. This is interestingly presented. The last 50 pages are devoted to a description of the exhibits of the Institution at A Century of Progress. These exhibits were strikingly displayed in the Hall of Science, which attracted spectacular attention during both summers of the Exposition, and the booklet describes and illustrates the various exhibits which were the subject of much favorable comment. In the display showing the activities of the Physiological Research Laboratories, it was pointed out that veterinary research work was a feature of these activities and included researches into such diseases as lamb dysentery, dog distemper, braxy in sheep, yellows in dogs (canine jaundice), bacillary white diarrhea in poultry, tetanus in horses, and fowl-pox.

D. M. OR M. D.

"But, madam, I'm afraid you've made a mistake. I'm a doctor, certainly, but I'm a Doctor of Music."

"I know that," replied the old lady, "and that's why I came to you. I've a terrible singing in my ears."

Boston Transcript.

COMMUNICATION

CREDIT WHERE CREDIT IS DUE

TO THE EDITOR:

I read, with great interest, the articles in the November issue of the JOURNAL of the A. V. M. A., on "Serum Concentrate-Living Virus Immunity Against Canine Distemper," by Dr. George Watson Little; "Further Observations on the Use of Serum Concentrate (Little) to Control Canine Distemper," by Dr. Wm. J. Lentz; "Experiments to Produce Immunity to Canine Distemper in Ferrets," by Dr. Victor Ross, and "Report on Serum Concentrate (Little)," by Dr. M. L. Morris; also the one in the *American Kennel Gazette*, of November, entitled, "American Prophylactic for Distemper," by Dr. E. R. Blamey. I cannot refrain, however, from calling attention to the fact that some injustice is being done the originators of the present-day methods used for the control of canine distemper, and, in justice to Laidlaw and Dunkin, the fact that, after all, these two excellent men should receive the credit they deserve.

As is well known, Laidlaw and Dunkin were selected to do the research on canine distemper, by the Distemper Council, consisting of some of the greatest men in medical science, both in Great Britain and in the United States. Their efforts have resulted not only in substantiating the work of Carré as to the cause of canine distemper, but also in very important studies on the disease proper, including its pathology, and, finally, they developed a method of prevention which is generally recognized to be effective when the products are properly prepared and carefully administered to dogs in condition for the treatment.

In their studies, they have, of course, not neglected to consider every possible method of improving the products and, with this in view, they experimented and published their results on the simultaneous treatment of canine distemper, which appeared in the *Veterinary Record* (London), of April 4, 1931, in which the following conclusions are given:

> (a) That serum and virus, side to side, simultaneous, inoculations promise well for the protection of susceptible dogs. The duration of the immunity thus secured is, as yet, unknown, but we consider it should be as good as that resulting from vaccine followed by virus.
>
> (b) That specific treatment of distemper by antiserum (at any rate in the early stages of the disease) is about to come forward as a practical measure.

Since the publication of this article, they have issued to dog-owners many hundreds of doses of such simultaneous treatment for the sole purpose of further developing it until it could be effectively used on dogs.

The primary difficulty has been the standardization of the serum in order to establish a proper balance between serum and virus administered simultaneously. A complement-fixation test with the serum offered such a possibility. Thus, the simultaneous treatment was developed and recommended by Laidlaw and Dunkin, as per quotation, more than three years ago.

With regard to the concentrated serum, quoting from one of the articles, it is stated: "Up to this time, it was claimed that it was impossible to produce a concentrated serum of known or standardized value." May I again call attention to an article, which appeared in the March, 1931, issue of the *Journal of Comparative Pathology and Therapeutics* (London), edited by Sir John M'Fadyean, entitled, "Studies in Dog Distemper. Dog Distemper Antiserum," by Laidlaw and Dunkin. In this very comprehensive and most interesting article, on page 16, a chapter appears on the fractionization and purification of canine distemper serum. Thus, Laidlaw and Dunkin concentrated anti-distemper serum by a procedure which is not new but which is being employed in various serums and antitoxins used for the prevention and treatment of human diseases.

In this same chapter, they describe how the serum can be concentrated if desired to a strength six or more times its original potency. It appears, therefore, that even concentration was accomplished by Laidlaw and Dunkin and published upon as early as 1931.

I wish further to quote an article which appeared in the *Veterinary Record*, of April 16, 1932, entitled, "Laidlaw-Dunkin Concentrated Antibody (Hyperimmune Serum) in the Treatment of Naturally Occurring Canine Distemper," by J. G. Wright, of the Royal Veterinary College, London. This only further substantiates my contention that concentrated canine distemper serum had been developed by Laidlaw and Dunkin, although they did not claim any priority for this because the procedure was commonly known to all those engaged in immunological work.

In connection with any claim that concentrated serum for treatment has certain advantages over the homologous serum employed, it appears evident that those who have suggested such advantages are either not familiar with fundamental principles in immunology, or have not given the matter serious thought.

The only important reason for concentrating serums is because most of the serums used in human practice have been produced from animals. Such serums, of course, contain foreign proteins which are allergenic to sensitized human beings and, therefore, when injected into the human body are apt to produce pronounced reactions. This, of course, would not be the case if human serums were employed for human beings. The object of concentration is to reduce the foreign proteins to a minimum and, thereby, eliminate as much as possible the incidence of anaphylaxis or serum sickness.

Thus, it is evident that, in employing a homologous serum in a concentrated form, either for prevention or treatment, there is no advantage whatsoever, but we might add that under certain conditions there are advantages in using the unconcentrated serum. An animal affected with distemper is always somewhat dehydrated and, therefore, a full dose of homologous serum has certain advantages analogous to a saline or blood transfusion, aside from its specific antibody content. There are no foreign proteins to be considered and all ingredients of the homologous serum are readily absorbed and assimilated by the animal. It is, therefore, apparent that there are no advantages whatever in employing a concentrated homologous serum in the treatment of canine distemper.

In mentioning the above, I simply desire to stress and emphasize the fact that the priority for the simultaneous treatment, likewise for the concentration of the serum (even if this were of value), belongs to Laidlaw and Dunkin. The long years of tireless study, which these two good men applied in their efforts to solve some of the problems connected with the control of distemper, should assure to them full credit for the advancement of our knowledge pertaining to the control of this infection.

In presenting these data, I am prompted solely by my personal admiration for the two men who deserve recognition for their work by dog-owners and veterinarians.

A. EICHHORN.

Pearl River, N. Y., November 24, 1934.

Fewer Deaths in U. S. in 1932

The death rate for the United States for 1932 was the lowest ever recorded, according to the report of Surgeon-General Hugh S. Cummings, of the U. S. Public Health Service.

VETERINARY MEDICAL ASSOCIATION OF NEW YORK CITY

October Meeting

The Veterinary Medical Association of New York City met at the Hotel New Yorker, October 3, 1934. Dr. John Crawford presided in the absence of Dr. A. Eichhorn, president, who was traveling in Europe.

The speaker of the evening was Dr. C. P. Zepp, chairman of the Committee on Post-Congress Clinic of the Twelfth International Veterinary Congress. Dr. Zepp discussed the operations and demonstrations of Dr. E. J. Frick, of Kansas State College, on epidural anesthesia; of Dr. E. K. Sales, of Michigan State College, on cesarean section; of Dr. A. R. Anderson, of Los Angeles, Calif., on setting fractured femurs with wire braces; and the paper of Dr. R. E. Nichols, of Ohio State University, on simplified blood examination.

Dr. Zepp then called on Dr. N. J. Pyle to discuss the pharmacological demonstration on the circulation, the contribution of Dr. H. H. Dukes, of New York State Veterinary College. In a few well-chosen words, Dr. Pyle refreshed in the minds of his listeners the action and importance of the various drugs and their action on the body.

Dr. B. J. Finkelstein, of Brooklyn, discussed the operation for a double inguinal hernia as performed by Dr. W. M. Mitchell, of the Royal (Dick) Veterinary College, Edinburgh, at the Congress Clinic. The subject was a chow dog owned by one of Dr. Finkelstein's clients. Dr. Finkelstein said that the animal had made a good recovery and that he had never seen such exact placement of sutures or such sterile healing of a wound as that following the operation.

Dr. J. B. Engle, of Summit, N. J., discussed the operation for enucleation of the eyeball, as done by Drs. H. J. Milks and H. C. Stephenson, of the New York State Veterinary College. Dr. R. S. MacKellar, Jr., described the method and technic used by Dr.

W. F. Guard, of Ohio State University, and Dr. D. A. Eastman, of Moline, Ill., in performing operations for the intestinal end-to-end anastomosis and cecectomy. Dr. Zepp's work as Chairman of his section was highly commended by the Association, which tendered him its most profound thanks and appreciation.

Dr. R. W. Gannett, of Brooklyn, performed a practical operation for the correction of luxation of the patella in dogs. Dr. Gannett explained the technic as he worked and told of several cases in which he had used this operation with satisfactory results. The operation consists of passing a probe-pointed bistoury through skin and muscle to the bone on the inside of the tibia just distal to the stifle-joint, about one inch below and one-half inch in from the front of the leg. The bistoury is inserted flat. When in position, the cutting edge is turned toward the skin and everything severed except the skin. A slight hemorrhage follows but should cause no concern. An antiseptic dressing is applied to the area daily to cleanse the field of operation. Dr. Gannett used morphin sulfate for his anesthesia and injected the field of operation with a novocain solution. This demonstration was well presented and enthusiastically received.

November Meeting

The November meeting of the Association was held at the Hotel New Yorker on the 7th. Dr. A. Eichhorn, who was also the speaker of the evening, presided. Before presenting his subject, he conferred individual praise upon Drs. C. P. Zepp, O. E. McKim and J. E. Crawford for their distinguished services in making the Twelfth International Veterinary Congress a success.

Turning to his subject, "Interesting Phases of Veterinary Science Abroad," Dr. Eichhorn stated that Europe was still singing the praises of the American veterinarians for their hospitality and also for the remarkable forward strides made in veterinary science. In Germany, Dr. Eichhorn found the veterinarians to be "well off." He stated that the enrollment in the medical colleges of the entire country would be limited to 15,000. A student, to be eligible for a medical or veterinary college, will be subject to the decision of an entrance committee, who will pass upon the fitness of each student who wants to study either human or veterinary medicine. In England, Dr. Eichhorn stated that the Royal (Dick) Veterinary College possessed the most modern and completely equipped small-animal hospital in the world. The hospital is divided into two parts, one for private patients and the other for charity cases. The hospital is in charge of Prof. Sir Frederick Hobday and Prof. G. H. Wool-

dridge. Subscriptions from the public and the veterinary profession have made this work possible. The project is not fully completed, but work is going forward steadily.

Dr. Eichhorn said that Dr. P. P. Laidlaw and Major G. W. Dunkin, of canine distemper fame, had turned their efforts to combating human influenza. This disease can be transmitted to ferrets and carried in its true form. In mice, it causes a fatal pleuro-pneumonia. At the present time, in England, a horse which has been repeatedly injected with the virus of influenza produces a serum which will neutralize the virus of human influenza, but as yet it has not been used on man. It has also shown its value by neutralizing the viruses of East African coast fever and yellow fever.

In comparing the veterinarians on the continent and those in America, Dr. Eichhorn stated that it is conceded that we are on a par. Our milk service is supreme. Not only do we lead in production and consumption, but our control of milk sanitation has won world-wide acclaim. Our meat-inspection service and our methods of handling this product amazed our visitors and it was conceded that our meat-inspection service was second to none. Dr. Eichhorn concluded his word tour by relating the events which occurred as the foreign delegates were conducted on their Post-Congress tours. This lecture was most interesting, and the many points brought out by Dr. Eichhorn about his trip and points of interest held the fascinated attention of the members.

The Association offered resolutions of condolence to the families of Dr. J. T. Glennon, of Newark, N. J., who died October 14, and Dr. Patrick Burns, of New York City, who died on November 2, 1934.

R. S. MacKellar, Jr., *Secretary.*

CENTRAL WISCONSIN VETERINARY ASSOCIATION

The annual meeting of the Central Wisconsin Veterinary Association was held at Thorp, September 15, 1934, with 42 veterinarians in attendance. An all-day clinic was held at the hospital of Dr. W. F. Nolechek. Small-animal and poultry practice was featured. Mastitis was also given a prominent place on the program. A banquet was held at a local cafe in the evening, followed by a business session. Drs. Walter Wisnicky and J. S. Healy, of Madison, were the principal speakers.

PENNSYLVANIA STATE VETERINARY MEDICAL ASSOCIATION

The fifty-second annual meeting of the Pennsylvania State Veterinary Medical Association convened at the Hotel Casey, Scranton, October 25, 1934, at 1:40 p. m. The meeting was called to order by the President, Dr. H. R. Church, of Harrisburg.

Hon. Stanley J. Davis, mayor of Scranton, delivered the address of welcome, the response being given by Dr. George A. Dick, dean of the School of Veterinary Medicine, University of Pennsylvania. The President then called for the reading of the minutes of the 1933 meeting, by the Corresponding Secretary, Dr. Thomas D. James, of Scranton. They were approved as read. The report of the Treasurer was then read and accepted.

Owing to the fact that it was considered essential that the afternoon be devoted to the subjects scheduled on the program, since some of the committee chairmen were not present and could not report, the literary program was presented. Dr. E. C. Deubler, of Newtown, presented a paper on "Cattle Practice," which was followed by an address on "Mastitis," by Dr. Crittenden Ross, Department of Milk Control, Bureau of Health, New York, N. Y., and by the report of the Association's delegate to the A. V. M. A. House of Representatives, Dr. T. E. Munce, of Harrisburg. The meeting was adjourned at 6 p. m.

The second-day program was featured by addresses by prominent veterinarians. Dr. W. J. Lentz, director of the Small Animal Clinic, University of Pennsylvania, reported on "Some Clinical Experiments on a New Preparation of Colloidal Silver Oxide." Dr. R. S. MacKellar, of New York, N. Y., president of the A. V. M. A., read a very inspiring paper on "Leonard Pearson: A Keystoner of a Keystone Profession." This paper, which was prepared especially for this meeting, will be published in the JOURNAL. Dr. M. F. Barnes, of the Pennsylvania Bureau of Animal Industry, discussed "Bang's Disease." The program closed with an address by Dr. N. F. Williams, past-president of the A. V. M. A.

Following the luncheon recess, officers for the coming year were chosen as follows: President, Dr. H. W. Turner, New Hope; first vice-president, Dr. H. W. Barnard, Lancaster; second vice-president, Dr. W. D. Fuller, Somerset; third vice-president, Dr. H. W. Barnes, Thompson; recording secretary, Dr. B. Scott Fritz, Strasburg; corresponding secretary, Dr. Thomas D. James, Scranton; treasurer, Dr. W. H. Ivens, Philadelphia; trustees, Drs. H. R. Church, Harrisburg; C. J. Marshall, Philadelphia; M. B. Herron,

Canonsburg; F. J. McNeal, Wilkes-Barre; H. B. Prothero, Johnstown.

After the election of officers, Dr. H. W. Herriott, of the Pennsylvania Bureau of Animal Industry, Harrisburg, delivered an address, assisted by Dr. F. A. Marshall, also of the Bureau. A motion was made and passed that the Association go on record as recommending the adoption of a race horse bill in the State of Pennsylvania. Installation of officers followed, and the meeting was adjourned at 5 p. m.

THOMAS D. JAMES, *Corresponding Secretary.*

WEST VIRGINIA VETERINARY MEDICAL ASSOCIATION

The annual meeting of the West Virginia Veterinary Medical Association was held in Charleston, October 30-31, 1934.

Featured on the program were Dr. W. W. Dimock, of the University of Kentucky, who spoke on "Horse Breeding and the Raising of Healthy Colts," and Prof. G. A. Bowling, of West Virginia University, who gave an address on "The Feeding of Dairy Cattle."

Dr. S. E. Hershey, of Charleston, was elected delegate to the House of Representatives of the A. V. M. A., and Dr. H. B. Langdon, of Charles Town, was named alternate. Members of the Association also decided on the last Tuesday and Wednesday in October as the regular dates for the annual meeting.

Officers chosen for the coming year are: President, Dr. S. R. White, Charleston; vice-president, Dr. H. C. Williams, Clarksburg; secretary-treasurer, Dr. J. H. Rietz, Morgantown (re-elected).

J. H. RIETZ, *Secretary.*

MICHIGAN-OHIO VETERINARY MEDICAL ASSOCIATION

The semi-annual meeting of the Michigan-Ohio Veterinary Medical Association was held at Adrian, Mich., November 8, 1934. It was the best meeting held for years from the standpoint of interest shown in the discussion of the subjects on the program. The attendance numbered about 30, of whom about 20 were from Ohio.

Dr. C. W. Witty, of Elmore, Ohio, read a paper on "Canine Distemper." This might seem to have been a commonplace sub-

ject, but the discussion led by Dr. E. K. Sales, of East Lansing, Mich., Dr. N. D. Backus, of Elyria, Ohio, and Dr. W. H. McKenzie, of Columbus, Ohio, made it highly instructive. Dr. Harry Fulstow, of Norwalk, Ohio, presented an interesting paper on "Mania Puerperalis," which covered his experience with this condition in cows over a period of 42 years. Dr. J. W. Marshall, of Genoa, Ohio, gave a paper on "Tympany in Cattle," which brought out much discussion concerning this condition, due to alfalfa and sweet clover, especially this fall. Dr. A. C. Schafstall, of New Washington, Ohio, read a paper on "Stomatitis in Cattle," a disease that was widespread throughout northern Ohio during the past summer and fall. The discussion was instructive to those who had had little experience with the disease.

Arrangements were made at this meeting to hold an outdoor clinic at the meeting in May, 1935.

E. C. W. SCHUBEL, *Secretary.*

PURDUE UNIVERSITY VETERINARY SHORT COURSE

The 1934 Short Course for Veterinarians at Purdue University was held October 23 to 26, a month earlier than in former years. The course opened Tuesday afternoon with a laboratory in testing for pullorum disease. Dr. F. C. Tucker, of Claypool, demonstrated methods of confining and holding birds for collecting blood samples, and the veterinarians were given an opportunity to set up and read the plate agglutination test. Drs. L. P. Doyle, L. O. Fish, A. L. Delez, J. F. Bullard and F. L. Walkey were in charge of this laboratory.

A variety of subjects was discussed on the second day. Dr. Doyle spoke on the general pathology of poultry diseases and Prof. J. H. Skinner discussed the work of the Agricultural Experiment Station, of which he is director. Mr. Thad Macey talked on problems in hatchery management. He advised veterinarians to test each lot of antigen before using it in breeding flocks, and make the test mean more as a control measure for pullorum disease. His department of the Indiana Farm Bureau Co-op Association is selecting breeding flocks free of paralysis and tumors. Other subjects discussed were the pathology of swine diseases, by Dr. Doyle; beef cattle production, by Prof. F. G. King; factors affecting agricultural prices, by Prof. J. B. Kohlmeyer; and common molds found in forage and grain, by Prof. J. F. Trost. Forage and grain infested with common molds,

and pure cultures of a few molds, were shown by Prof. Trost in order to help veterinarians identify the different species.

On Thursday morning, Dr. H. Preston Hoskins, of Chicago, gave an address on veterinary education. He presented the latest statistics on the enrollment of veterinary students in the various colleges and commented on the unusually large increase in the number of new students enrolled this fall. Dr. Hoskins mentioned some of the possible causes that had contributed to this renewed interest in veterinary medicine and stated that, in his opinion, a golden opportunity was being offered those colleges, still on the four-year basis, to inaugurate the five-year curriculum in veterinary medicine. He stated that, although the veterinary profession is not crowded at the present time, it might become so in a very few years unless steps were taken to control as far as possible the number of veterinarians being graduated. Dr. Hoskins briefly explained the system of selective admissions being used in several colleges.

Drs. H. Busman, B. A. I. Inspector in Charge, and J. L. Axby, State Veterinarian, discussed the federal plan for the control of Bang's disease and the clean herd plan. Feeding and management of dairy cattle was discussed by Prof. J. H. Hilton. His lecture was practical and timely, as emphasis was given to the feeding of rations consisting of roughage and grains that Indiana farmers have grown this year.

Thursday afternoon and Friday were devoted largely to a horse clinic. Dr. W. B. Craig, of Indianapolis, was assisted by Drs. J. F. Bullard, C. C. Donelson, S. M. Friedley and C. H. Smith. Single G, one of the best known horses in the racing world, now 24 years old, was brought to the clinic for dental work. Other operations were: enucleation of the eye, relief of hyperplasia of the nasal septum, ventriculo-chordectomy, ovariectomy in a mare, and tenotomy of the superficial and deep digital flexors. In addition to the above clinic, methods of animal restraint were demonstrated and several birds caponized. More than 150 veterinarians attended, and the attendance at each session averaged about 100.

R. A. CRAIG, *Reporter.*

ILLMO VETERINARY MEDICAL ASSOCIATION

The annual meeting of the Illmo Veterinary Medical Association was held at Bellevue Park, Belleville, Ill., September 22, 1934. Officers elected for the coming year are: President, Dr. W. M. Kyle, Lebanon, Ill.; vice-president, Dr. W. J. Schmidt, Millstadt, Ill.; secretary-treasurer, Dr. J. T. Brown, Belleville, Ill.

CENTRAL OHIO VETERINARY MEDICAL ASSOCIATION

The annual meeting of the Central Ohio Veterinary Medical Association was held at the Hotel Harding, Marion, October 23, 1934. Dr. David C. Hyde, of Columbus, was the principal speaker. Officers named for the coming year are: President, Dr. O. C. Alspach, Marion; secretary-treasurer, Dr. H. A. Hoopes, La Rue.

McLEAN COUNTY VETERINARY MEDICAL ASSOCIATION

The McLean County (Ill.) Veterinary Medical Association met at Bloomington, October 2, 1934. The resignation of Dr. J. S. Koen, who had served as secretary-treasurer for the past ten years, was accepted, and Dr. J. G. Blum, of Normal, was elected to succeed him. Dr. L. W. Moore, of Lexington, was chosen president.

MAINE VETERINARY MEDICAL ASSOCIATION

The quarterly meeting of the Maine Veterinary Medical Association was held at the DeWitt Hotel, Lewiston, October 11, 1934, with fourteen members present. Papers were read by Dr. E. E. Russell, of Farmington, and Hon. H. M. Tucker, of the Bureau of Animal Industry, Augusta.

R. E. LIBBY, *Secretary.*

Serum for Undulant Fever

Twenty undulant fever patients restored to health and normal activity by the use of a new serum constitute a record reported by a group of Cincinnati investigators to the American Society of Tropical Medicine at its meeting in San Antonio, Tex., on November 14, 1934, according to *Science*. The serum was produced from goats after inoculating them with chemically treated suspensions of the organism that causes the disease. The group responsible for the discovery is composed of Drs. W. B. Wherry, A. E. O'Neil and Lee Foshay, of the University of Cincinnati College of Medicine and the Cincinnati General Hospital.

Men are most apt to believe what they least understand.—MONTAIGNE.

NECROLOGY

ALFRED J. MALONEY

Dr. Alfred J. Maloney died in Bailey Jones Hospital, Ithaca, N. Y., August 11, 1934, after a long illness.

Born in Ithaca, N. Y., October 25, 1880, Dr. Maloney received his early education in local schools and then entered Cornell University for the study of veterinary medicine. He was graduated with the class of 1906. Soon after graduation, he entered the service of the U. S. Bureau of Animal Industry and, at various times, was stationed at National Stock Yards, Ill., Phoenix, Ariz., Yakima, Wash., and San Diego, Calif., on meat inspection. At the time of his retirement from government service, he was inspector-in-charge at San Diego.

Dr. Maloney joined the A. V. M. A. in 1918. He was a member of the National Association of B. A. I. Veterinarians and of the Knights of Columbus. He is survived by one son and two sisters.

LAYMAN B. DUNLAP

Dr. Layman B. Dunlay, a member of the U. S. Bureau of Animal Industry field force in Colorado, died at Montrose, Colo., August 27, 1934, following a pulmonary hemorrhage.

Born at Mount Air, Iowa, October 18, 1884, Dr. Dunlap attended the public schools at Shannon City, Iowa, before entering Iowa State College for the study of veterinary medicine. Following his graduation in 1908, he engaged in private practice at Tingley, Iowa, for about a year. He then entered the service of the U. S. Bureau of Animal Industry, and his first assignment was at Chicago, Ill. From 1911 to 1913, he was assigned to field work in North Dakota and Montana. Later, he was transferred to meat inspection at Lewiston, Idaho, and Salt Lake City, Utah. He was inspector-in-charge at the latter station until 1919, when he was transferred to field work in Colorado.

Dr. Dunlap was a member of the National Association of B. A. I. Veterinarians and of the Elks. He is survived by his mother and two brothers.

JESSE D. FOSTER

Dr. Jesse D. Foster, of Newtown, Pa., died February 25, 1934. He was a graduate of the United States College of Veterinary Surgeons, Washington, D. C., class of 1903, and had been engaged in general practice at Newtown for over thirty years. He joined the A. V. M. A. in 1915 and was a member of the Pennsylvania State Veterinary Medical Association.

WILLIAM T. GILCHRIST

Dr. W. T. Gilchrist, of Norfolk, Va., died of a heart attack, June 15, 1934. He was a graduate of the Ontario Veterinary College, class of 1889. He first located at Fort Edward, N. Y., soon going to Norfolk, where he was a general practitioner up to the time of his death. He was a charter member of the Virginia State Veterinary Medical Association (1894), was elected to the presidency at the 1898 meeting and served for two years. In 1902, he was elected secretary-treasurer and served until 1908. He was a member of the Virginia State Board of Veterinary Examiners for a good many years.

Dr. Gilchrist joined the A. V. M. A. in 1910.

WILLIAM G. SCHNEIDER

Dr. W. G. Schneider, of Gettysburg, S. Dak., died at his home, October 14, 1934, following a stroke of apoplexy.

Born in Oshkosh, Wis., May 28, 1874, Dr. Schneider grew to manhood there. He attended the Saint Joseph Veterinary College and received his degree in 1912. Following his graduation, he located in Gettysburg and practiced there until his death.

Dr. Schneider joined the A. V. M. A. in 1917. He was also a member of the South Dakota Veterinary Medical Association. Dr. Schneider never married. Surviving are two brothers and five sisters. Burial was made in Oshkosh, Wis.

G. E. M.

HENRY ROHRER MILLER

Dr. Henry R. Miller, for the past two years instructor in anatomy at the New York State Veterinary College at Cornell University, died October 16, 1934, at Mamaroneck, N. Y., after an illness of five months due to a complication of diseases.

Born in New York City in 1896, Dr. Miller moved to Mamaroneck with his parents as a child in 1903. He was graduated from the Rye Neck High School in 1915. During the World War, he served in the U. S. Navy. Dr. Miller received the degree of Bachelor of Science from Cornell University in 1920. In 1928, he returned to his alma mater to study veterinary medicine and received his veterinary degree in 1932. During 1931, he was a student assistant in veterinary anatomy and had been an instructor in that subject since graduation.

Dr. Miller came of a family prominent in the veterinary profession. His father, Dr. H. K. Miller (N. Y. C. V. S. '91), is a practitioner at Mamaroneck, in association with another son, Dr. Walter Rohrer Miller (Corn. '26). An uncle, Dr. C. G. Rohrer (N. Y.-Amer. '08), is a prominent practitioner in New York City. His widow (née Helen Grant), a graduate of Cornell University and until last June dietitian of Balch Halls, and a sister also survive.

Dr. Miller was a member of Theta Xi, Alpha Psi and Phi Zeta fraternities.

PATRICK BURNS

Dr. Patrick Burns, of New York, N. Y., died November 2, 1934. He was a graduate of the New York College of Veterinary Surgeons, class of 1888. He was a member of the Veterinary Medical Association of New York City.

JOHN C. STRESSER

Dr. John C. Stresser, of Chicago, Ill., died at his home, November 6, 1934. He was a graduate of the McKillip Veterinary College and conducted a small-animal hospital at 5144 West Grand Avenue. He was a member of the Chicago Veterinary Medical Association, Justice Lodge No. 949, A. F. & A. M., and Northwest Chapter No. 224, R. A. M. Surviving Dr. Stresser are his widow (née Lena Nenning), one son and one daughter.

ANDREW G. VOGT

Dr. Andrew G. Vogt, of Newark, N. J., died November 15, 1934, at the Hotel Douglas, Newark, where he recently had made his home. He was 69 years old. During recent years, Dr. Vogt spent much of his time at his summer home at Allenhurst, N. J.

Born in Newark, Dr. Vogt attended local schools and the American Veterinary College in New York City He was graduated in 1884 and entered private practice in Newark. During the Indian raids in the West in the late '80's, Dr. Vogt enlisted in the Army. He was veterinarian in Troop G, 8th Regiment, U. S. Cavalry, which participated in the round-up of Geronimo, the famous Indian chief, in Texas and New Mexico.

Following his service in the Army, Dr. Vogt returned to Newark and resumed private practice. In 1896, he was appointed Receiver of Taxes and held the position until 1900. Later, he was nominated for County Supervisor, but was defeated.

Dr. Vogt joined the A. V. M. A. in 1884, and just three months prior to his death his name had been placed on the honor roll of the A. V. M. A., upon the completion of 50 years of uninterrupted active membership. His is the first death to occur since the establishment of the honor roll. Dr. Vogt was a member of the Committee on Army Legislation (1897-98). He was a member of the Veterinary Medical Association of New Jersey. He was also active in civic and fraternal affairs, having been a member of Saint John's Lodge, F. & A. M., Damascus Commandery, Knights Templar, and Union Lodge, R. A. M. Dr. Vogt's first wife (née Emma L. Schmidt) died in 1916. Later, Dr. Vogt married the sister of his first wife, Miss Julia A. Schmidt, who survives him.

PROF. CARLOS CHAGAS

Prof. Carlos Chagas, director of the Oswaldo Cruz Bacteriological Institute, Rio de Janeiro, Brazil, died November 8, 1934, at the age of 55. He was credited with discovering the cause of Chagas disease and was a member of the Leprosy Committee of the League of Nations. Prof. Chagas was honorary president of the Brazilian National Committee of the Twelfth International Veterinary Congress.

MARTIN C. MANNION

Dr. M. C. Mannion, of Hazelton, Iowa, died at the Saint Francis Hospital, Waterloo, Iowa, October 6, 1934, following an operation for gallstones. He was 54 years old. He was graduated from McKillip Veterinary College with the class of 1910, and had been in general practice during his entire professional career except for a brief period of service in the U. S. Bureau of Animal Industry. Dr. Mannion is survived by his widow and one son.

E. BRAINERD

Dr. E. Brainerd, of Memphis, Mo., died at his home, November 2, 1934, after an illness of several months. In July, he underwent an operation at the Mayo Clinic, Rochester, Minn., but the operation failed to relieve his condition and he continued in poor health up until his death.

Born in Clark County, Mo., November 17, 1862, Dr. Brainerd attended local schools and then taught school in Clark and adjoining counties before entering the University of Missouri. Later, he decided to study veterinary medicine and entered McGill University, Montreal, Canada. He was graduated in 1893 and located at Memphis, Mo., where he became actively identified with civic, business and professional affairs. He served as mayor of Memphis for two terms and was chairman of the Democratic County Central Committee. A few years ago, on account of the poor health of his wife, Dr. Brainerd disposed of his interests in Memphis and removed to Colorado Springs, Colo. They returned to Memphis three years ago.

Dr. Brainerd joined the A. V. M. A. in 1893 and, at the time of his death, was one of four members who joined that year who were still on the roll. Dr. Brainerd was active in religious circles and all branches of Masonry. He is survived by his widow (née Inez Cunningham) and two sisters.

MARK A. STEWART

Dr. M. A. Stewart, of Richmond, Ind., was found dead, together with his 83-year-old father, in the bathroom of their residence, November 19, 1934. He was 57 years of age.

Police, who had been summoned after neighbors had detected the odor of gas, said that the two men had been dead 48 hours or longer. Evidence indicated that the father had turned on the gas in a heater in the bathroom for the purpose of committing suicide, and that the son had lost his life in an attempt to rescue his father. Dr. Stewart was a graduate of the Chicago Veterinary College, class of 1902. He had resided in Richmond for a number of years and was well known throughout Wayne County. At one time, he had been in the service of the U. S. Bureau of Animal Industry and stationed at the Union Stock Yards, Chicago, Ill. He is survived by one sister, two aunts and two uncles.

LESLIE H. BLEECKER

Dr. Leslie H. Bleecker, of Neenah, Wis., died suddenly at his home, November 21, 1934, following a heart attack. Dr. Bleecker was graduated from the Chicago Veterinary College in 1908 and shortly thereafter located for practice in Neenah. He gave up his practice in 1916 to enter the automobile business, in which he continued until his death. Surviving are his widow, one daughter, his mother and one brother. Dr. D. E. Bleecker (Chi. '09) of Columbus, Wis., is a cousin of the deceased.

D. E. B.

PERSONALS

MARRIAGES

Dr. Wm. H. Ahlers (Iowa '33), of Sioux City, Iowa, to Miss Mary Ann Seamonds, of Maquaketa, Iowa, October 20, 1934.

Dr. William Edgar Martindale (U. P. '28), of Harrisburg, Pa., to Miss Katherine Mateer Bennett, at Kahagon, Duncannon, Pa., October 19, 1934.

Dr. Harry K. Royer (U. P. '33), of Stevens, Pa., to Miss Norine Schlegel, October 9, 1934.

BIRTH

To Dr. and Mrs. H. L. Morrison, of Nowata, Okla., a son, Richard Charles, October 2, 1934.

PERSONALS

Dr. T. P. Rothrock (Iowa '34) is practicing at Calmar, Iowa.

Dr. Robert O. Rydell (Iowa '34) is now located at Wheaton, Minn.

Dr. George B. Schuey (Ont. '10), of Pittsburgh, Pa., is an archery enthusiast.

Dr. Samuel Apt (U. P. '32), formerly of Philadelphia, Pa., is now located at Cynwyd, Pa.

Dr. L. C. Schantz (Corn. '30), formerly of Lowville, N. Y., is now located at Decatur, Ga.

Dr. J. W. Parker (K. C. V. C. '00) has removed from Oskaloosa, Kan., to Lawrence, same state.

Dr. C. R. Omer (K. S. C. '29) has changed his address from Rahway, N. J., to Metuchen, N. J.

Dr. L. O. Heinrich (San Fran. '13) has changed locations from Corcoran, Calif., to Tulare, same state.

Dr. H. D. Pritchett (U. P. '34) has opened an office for general practice at 4737 Large Street, Philadelphia, Pa.

Dr. B. C. McClintock (Chi. '94) has changed the base of his operations from Vicksburg, Mich., to Imley City, same state.

DR. J. H. MCLEOD (McGill '94), of Charles City, Iowa, accompanied by Mrs. McLeod, spent two months in Europe the past summer.

DR. N. W. ACKERMAN (Iowa '15), of Van Horne, Iowa, has joined the meat-inspection staff of the U. S. Bureau of Animal Industry in Chicago.

DR. R. M. COCKING (Iowa '34), of Postville, Iowa, has accepted a position in the Department of Veterinary Anatomy at Iowa State College.

DR. GEORGE E. MELODY (Chi. '13), of Hoven, S. Dak., has opened an office in Gettysburg, S. Dak., and will move his family there in the spring.

DR. A. A. HERMANN (Colo. '10), of Denver, Colo., is already making his plans to attend the 1935 convention of Rotary International in Mexico City, Mexico.

DR. F. W. MEIER (Mich. '32), of Flint, Mich., is a member of the Flint Exchange Club and recently addressed the organization on "Mine, Yours and the Other Fellow's Dog."

DR. R. B. CONAWAY (Iowa '32), of Millersburg, Iowa, has accepted a temporary appointment in the U. S. Bureau of Animal Industry and has been stationed at Denver, Colo.

DR. C. L. ROADHOUSE (Corn. '06), head of the Division of Dairy Industry, University of California, has been elected president of the American Dairy Science Association.

DR. M. J. HUGGINS (Chi. '13), of Edwardsville, Ill., Madison County Veterinarian, suffered a fractured bone in his right hand recently while applying the tuberculin test to a cow.

DR. CLAUDE H. READING (Mich. '27) has resigned his position with the Wisconsin Department of Agriculture and Markets, and has opened a small-animal hospital in Madison, Wis.

DR. N. S. MAYO (Chi. '89), of Highland Park, Ill., accompanied by Mrs. Mayo, will spend the winter months in the South. They will have their headquarters at Mount Dora again.

DR. CARL J. WALLEN (O. S. U. '23), formerly at the Poultry Pathological Laboratory, Balboa Park, San Diego, Calif., is now with the Puritan Poultry Corporation, Atascadero, Calif.

DR. ERNEST F. WALLER (Iowa '31), who has been at University Farm, Saint Paul, Minn., for the past three years, is now back at Iowa State College, in the Department of Veterinary Pathology.

DR. CLIFF D. CARPENTER (Corn. '20), secretary of the California State Veterinary Medical Association, has reported a change of address from 3684 Beverly Blvd., to 337 Central Ave., Los Angeles, Calif.

DR. E. E. THOMPSON (Iowa '34), who has been located at Woodstock, Va., since his graduation, has accepted a temporary appointment in the U. S. Bureau of Animal Industry and has been stationed in Oklahoma.

DR. R. C. CALKINS (Chi. '08), who has been practicing in Rock Island, Ill., for the past seven years, recently opened a new hospital at 2312 Fifth Avenue, after spending approximately $2,000 remodeling the building.

DR. A. F. SCHREAR (Chi. '13), of Darlington, Wis., has been elected chairman of the Lafayette County Board of Supervisors. He has represented the second ward of his city for three years and has held posts on several important committees.

DR. H. H. CLARK (Mich. '27), who has been located at Perry, Mich., for the past seven years, has removed to Lansing, Mich., and entered a partnership with Dr. Eugene E. Hamann (Mich. '31) in the operation of a small-animal hospital.

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